

IS31LT3935 Bulb Lighting Evaluation Board Guide

Description

The Flicker-Free™ IS31LT3935 is a single stage current mode LED driver optimized for high power factor and compatibility with all TRIAC dimmers. The PFC architecture enables excellent power factor over a wide range of operating line and load conditions, even with the simplest of inductor based driver topologies, thereby reducing system cost and size while maximizing efficiency.

The IS31LT3935 LED controller features patent pending AccuDim™ flicker-free dimming technology that mimics the characteristics of an incandescent light bulb. It presents a dynamic impedance to the dimmer and integrates an active bleed circuit for true dimming performance across all dimmers.

The device is available in a tiny 10 lead DFN-EP (3mm x3mm) package. It operates over the temperature range of -40°C to +85°C.

Features

- Smooth 0-100% Flicker-free Dimming Range
- Compatibility with all TRIAC Dimmers (Digital, Leading and Trailing-edge)
- Near unity PFC without External PFC Circuitry
- Spread Spectrum Switching for Reduced EMI
- Low 500µA Quiescent Current
- Protections:
 - Soft Start
 - Under-voltage, (Over-voltage) Lockout
 - Thermal Shutdown

Applications

- Dimmable Retrofit LED Lamps and Luminaries 8 to 30W
- Industrial and Commercial Lighting
- Offline LED Driver Modules and Bricks

Quick Start

Recommended Equipment

- 85~265VAC/50~60Hz power supply
- LED array(12 in series)40Vdc-0.35A
- 220V input TRIAC Dimmer

For pricing, delivery, and ordering information, please contact ISSI at analog_mkt@issi.com or call +1-408-969-6600

WARNING: Operating this demo board at output voltages other than the designed output target voltage may reduce system performance, and in some cases may damage the IC or other circuit components.

Absolute Maximum Ratings

- ≤ 264VAC power supply
- ≤ 47V Vout (Total Vf)

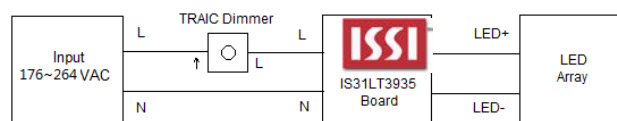
Caution: Do not exceed the conditions listed above, otherwise the board will be damaged or the output will be limited

Procedure

The IS31LT3935 DEMO Board is fully assembled and tested. Follow the steps listed below to verify board operation.

Caution: Do not turn on the power supply until all connections are completed.

- 1) Connect the positive terminal of the LEDs to the LED+ of the DEMO and the negative terminal of the LEDs to the LED- of the Evaluation Board.
- 2) Connect the input pin N of the Evaluation Board via the main power switch to AC power supply N.
- 3) Connect the input pin L of the Evaluation Board via TRIAC Dimmer pin L, Another pin of TRIAC Dimmer Connect to the AC power supply L.
- 4) Turn on the power supply, Adjust the angle of TRIAC Dimmer

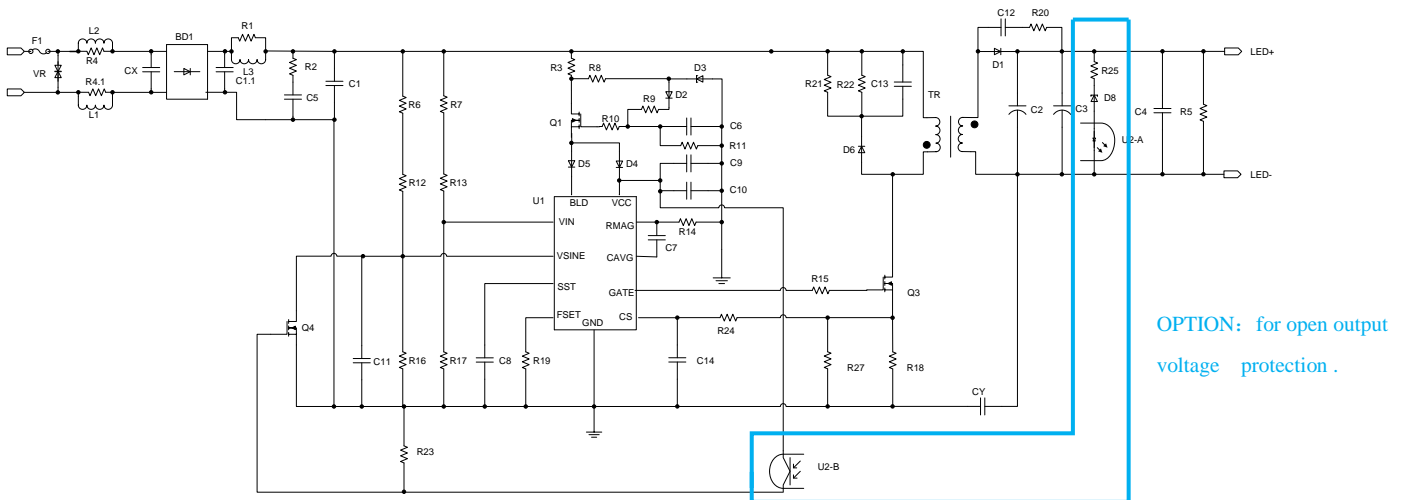


Ordering Information

PART#	TEMP RANGE	IC PACKAGE
IS31LT3935-DLS2-TR	-40 to 125°C	DFN-10 (Exposed Pad)

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Figure 1 IS31LT3935 Evaluation Board Schematic Note: ISSI Evaluation



Board does not include a LED array



Figure 2 Picture of Evaluation Board

NOTE: Physical dimensions are (LxWxH): 73mmx25mmx23mm

PCB Layout

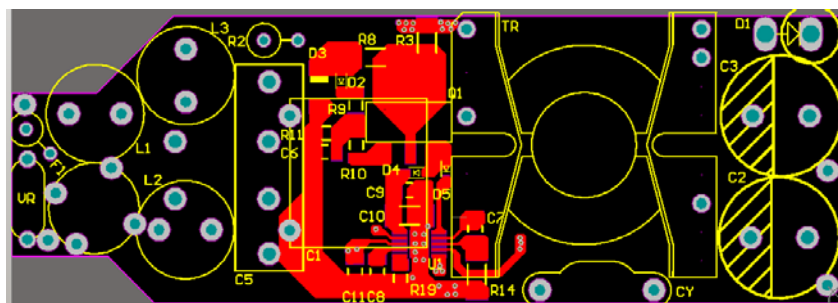


Figure 3 PCB Layout – Top layer

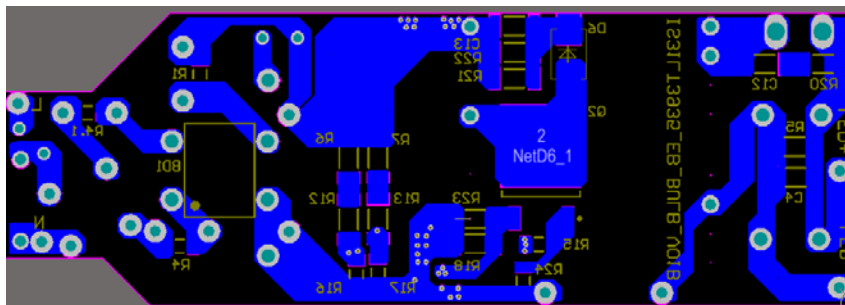


Figure 4 PCB Layout – Bottom layer

Bill of Materials

No.	Name	Description	Ref Des.	Qty.	Mfr P/N
1	FUSE	1A250V ϕ 3	F1	1	
2	MOV	7D471 PIN7	VR	1	
3	Bridge rectifier	DB107 DIP4	BD1	1	
4	Inductor	6mH 0810	L1, L2	2	
5	Inductor	10mH 0810	L3	1	
6	Transformer	450uH PQ2016	TR	1	
7	Resistor	5.1k Ω 1% 0805	R1, R4, R4.1	3	
8	Resistor	510 Ω 1% 1W	R2	1	
9	Resistor	200k Ω 1% 1206	R6	1	
10	Resistor	180k Ω 1% 1206	R12	1	
11	Resistor	3k Ω 1% 0805	R16	1	
12	Resistor	270k Ω 1% 1206	R7	1	
13	Resistor	200k Ω 1% 1206	R13	1	
14	Resistor	2k Ω 1% 0805	R17	1	
15	Resistor	10 Ω 1% 1206	R3	1	
16	Resistor	30 Ω 1% 1206	R14	1	
17	Resistor	200k Ω 1% 1206	R8	1	
18	Resistor	15k Ω 1% 0805	R9	1	
19	Resistor	1.0 Ω 1% 0805	R15	1	
20	Resistor	100 Ω 1% 0805	R10	1	
21	Resistor	240k Ω 1% 0805	R11	1	
22	Resistor	68k Ω 1% 1206	R5	1	
23	Resistor	0.16 Ω 1% 1206	R18	1	
24	Resistor	NC	R27	1	
25	Resistor	300k Ω 1% 1206	R21, R22	2	
26	Resistor	180k Ω 1% 0805	R19	1	
27	Resistor	51 Ω 1% 0805	R25	1	

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28	Resistor	10K Ω 1% 0805	R23	1	
29	Resistor	0 Ω 0805	R24	1	
30	CBB-CAP	68nF 630V pin10	C1	1	
31	CBB-CAP	220nF 630V pin15	C5	1	
32	E-CAP	330uF 50V 1020	C2,C3	2	
33	SMD-CAP	22nF 25V X7R 0805	C6	1	
34	SMD-CAP	1uF 25V X7R 0805	C7,C8	2	
35	SMD-CAP	10uF 25V X7R 1206	C9,C10	2	
36	SMD-CAP	33PF 25V X7R 0603	C11,C14	2	
37	SMD-CAP	1nF 1000V X7R 1206	C13, C1.1	3	
38	Y1-CAP	1nF PIN10	CY	1	
39	SMD-DIODE	ES2G	D1	2	
40	SMD-DIODE	FR107	D6	1	
41	SMD-DIODE	1N914BWT SOD-523F	D2,D4,D5	3	
42	SMD-ZENER	9.1V 1% SOD-80	D3	1	
43	SMD-ZENER	47V 1% SOD-80	D8	1	
44	MOS	NDS7002 SOT-23	Q4	1	
45	MOS	AOD4S60 TO-252	Q3	1	
46	MOS	BSP125 SOT223	Q1	1	
47	IC	IS31LT3935 DFN10	U1	1	
48	Photo-coupler	EL357 MSOP-4	U2	1	
49		NC	R20, C4,C12	0	
50	X2-CAP	27nF 275Vac Pin=10mm	CX	1	

NOTE: Please ensure that the Dimmer specifications are suitable for the application voltage and frequency.

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Transformer Design

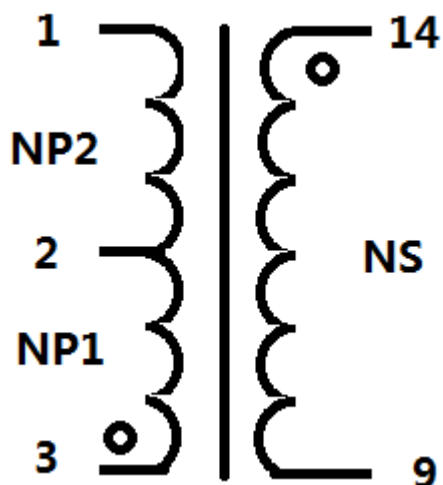
ELECTRICAL SPECIFICATIONS:

1. Primary inductance(L_p)=450uH@10kHz
2. Primary Leakage Inductance (L_k)< = 20uH @10KHz
3. Electrical Strength = 3KV, 50/60Hz,1Min

MATERIALS:

1. Core:PQ2016(Ferrite Material TDK PC40 or equivalent)
2. Bobin:PQ2016 Primary 6,Secondary:8
- 3.. Magnet Wires (Pri) : Type 2-UEW
4. Magnet Wire (Sec) : Triple Insulated Wires
5. Layer Insulation Tape :3M1298 or equivalent.

SCHEMATIC



NO.	winding	Start	End	number of turns	number of plies	diameter	number of plies	tape	remarks
1	NP1	3	2	17T	2	0.40mm-2-UEW	2	0.02*7.5mm	
2	NS	14	9	16T	2	2P*0.20mm-TEX	3	0.02*7.5mm	
3	NP2	2	1	16T	1	0.40mm- 2-UEW	2	0.02*7.5mm	



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Line Regulation and Efficiency

Input Voltage	Input Power	THD	PF	Output Voltage	Output Current	Efficiency
198Vac/50Hz	17.38	23.9%	0.964	39.8	378	86.56%
220Vac/50Hz	18.86	25.7%	0.945	40.2	404	86.11%
242Vac/50Hz	19.84	31.5%	0.923	39.9	426	85.67%

Load Regulation and Efficiency

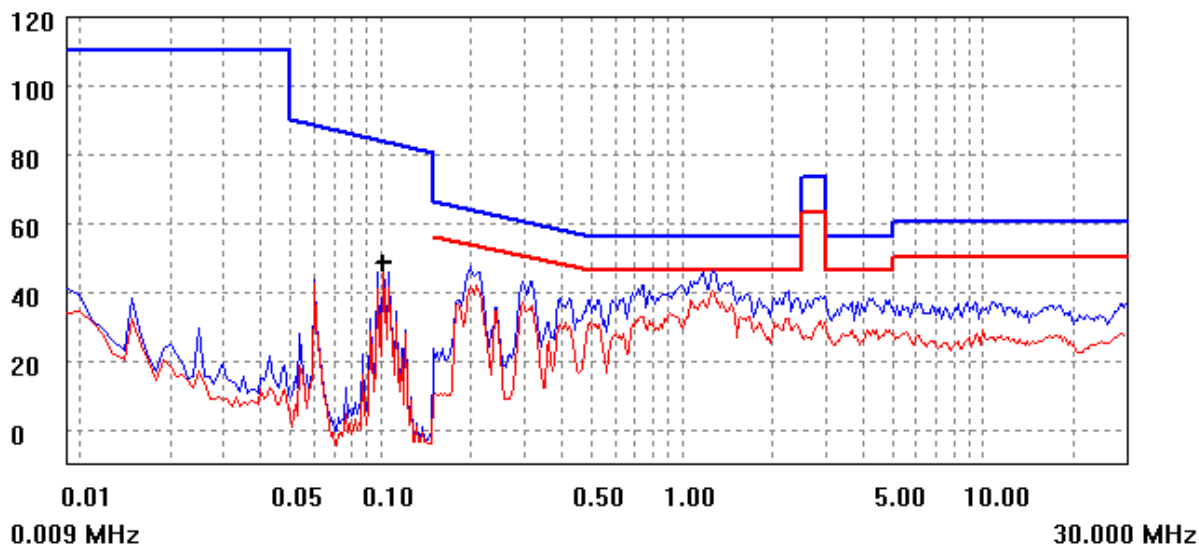
Input Voltage	Input Power	THD	PF	Output Voltage	Output Current	Efficiency
220Vac/50Hz	18.60	25.7%	0.944	35.53	453	86.53%
220Vac/50Hz	18.86	25.7%	0.945	40.2	404	86.11%

EMI TEST REPORT

Organization: ISSI	Operator: lory	EUT: IS31LT3935
Place: XM	Time: 2013/11/8/15:21	
Detector: PK+AV	Test-time(ms): 10	
Limit: EN55015	Transducer: PK0	
Remark: IS31LT3935 220V 40V 0.35A L		

Start(MHz)	End(MHz)	Step(MHz)
0.009	0.150	0.001
0.150	3.000	0.002
3.000	10.000	0.020
10.000	30.000	0.025

dBuV



final test

(AV)	freq(MHz)	lev(dBuV)	Lim(dBuV)	Δ (lev-Lim)
	0.101	48.3	0.0	48.3

Figure 5. L line



EMI TEST REPORT

----- parameter

Organization: ISSI	Operator: lory	EUT: IS31LT3935
Place: XM	Time: 2013/11/8/15:18	
Detector: PK+AV	Test-time[ms]: 10	
Limit: EN55015	Transductor: PK0	

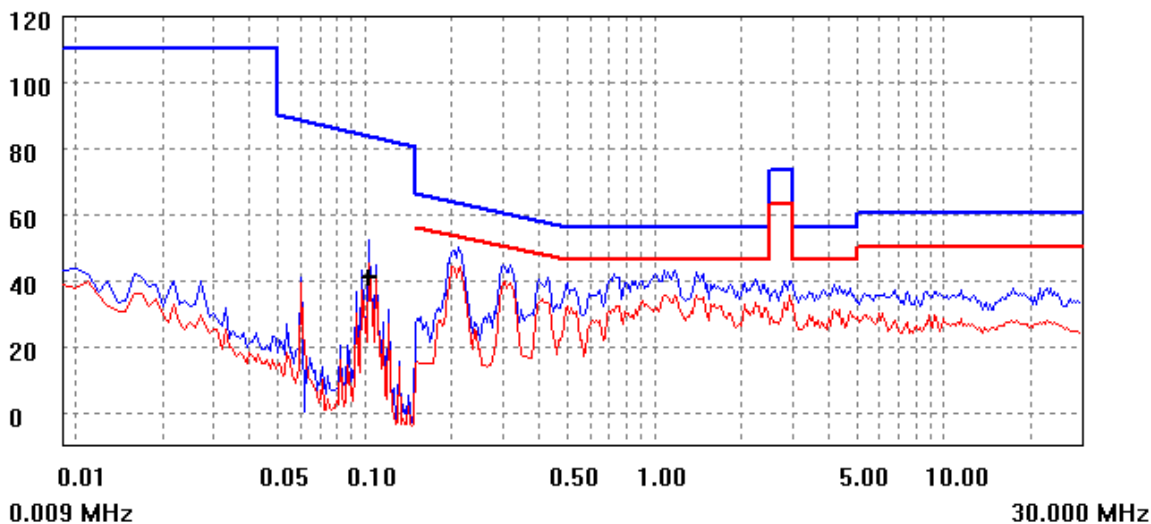
Remark: IS31LT3935 220V 40V 0.35A N

----- freq, step

Start(MHz)	End(MHz)	Step(MHz)
0.009	0.150	0.001
0.150	3.000	0.002
3.000	10.000	0.020
10.000	30.000	0.025

----- scan result

dBuV



----- final test

(AV)	freq(MHz)	lev(dBuV)	Lim(dBuV)	Δ(lev-Lim)
	0.103	40.4	0.0	40.4

Figure 6. N line

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