

iML8683 – 120V_{AC} 11W EVM

– Application Notes –

Table of Content

1. IC Description	2
2. Features.....	2
3. Package and Pin Diagrams.....	2
4. Application Circuit	3
5. PCB Layout and Photograph.....	3
6. Schematic of PCB.....	4
7. Bill of Materials.....	4
8. Performance Data and Typical Characteristic.....	5
8.1 Test result.....	5
8.2 Power Factor vs. V _{AC}	5
8.3 THD vs. V _{AC}	5
8.4 Input Voltage and Input Current.....	6
8.5 TRIAC Dimming Waveforms	7
8.5.1 Leading Phase TRIAC Dimming	7
8.5.2 Trailing Phase TRIAC Dimming	8
8.5.3 Compatible Dimmers	9
9. Surge Performance	10
10. EMI Performance	11

1. IC Description

The iML8683 is a Three Terminal Current Controller (TTCC) for regulating the current flowing through an LED string.

The application of the iML8683 is configured in parallel with an LED string. The iML8683 can work as voltage controlled current source, current regulator, or cut-off. It is suitable for the applications adopting periodical AC voltage source.

The PCB layout is also very flexible to meet various shape requirements. It is especially suitable for replacing incandescent light bulb and linear type fluorescent lamp.

2. Features

■ System

- ✓ All solid state components
- ✓ No electrolytic capacitor needed
- ✓ Compact size
- ✓ High Power Factor and Low Total Harmonic Distortion Performance
- ✓ High efficiency
- ✓ Flexible PCB layout style
- ✓ Wide range of LED forward voltage selection

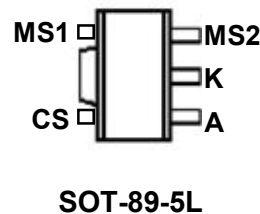
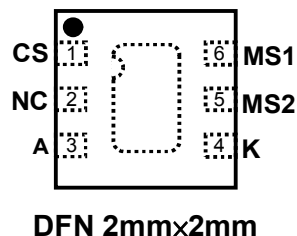
■ Chip

- ✓ 88V input sustaining voltage.
- ✓ 3V dropout voltage for up to 150mA regulating current.
- ✓ Chip-on-board process available.

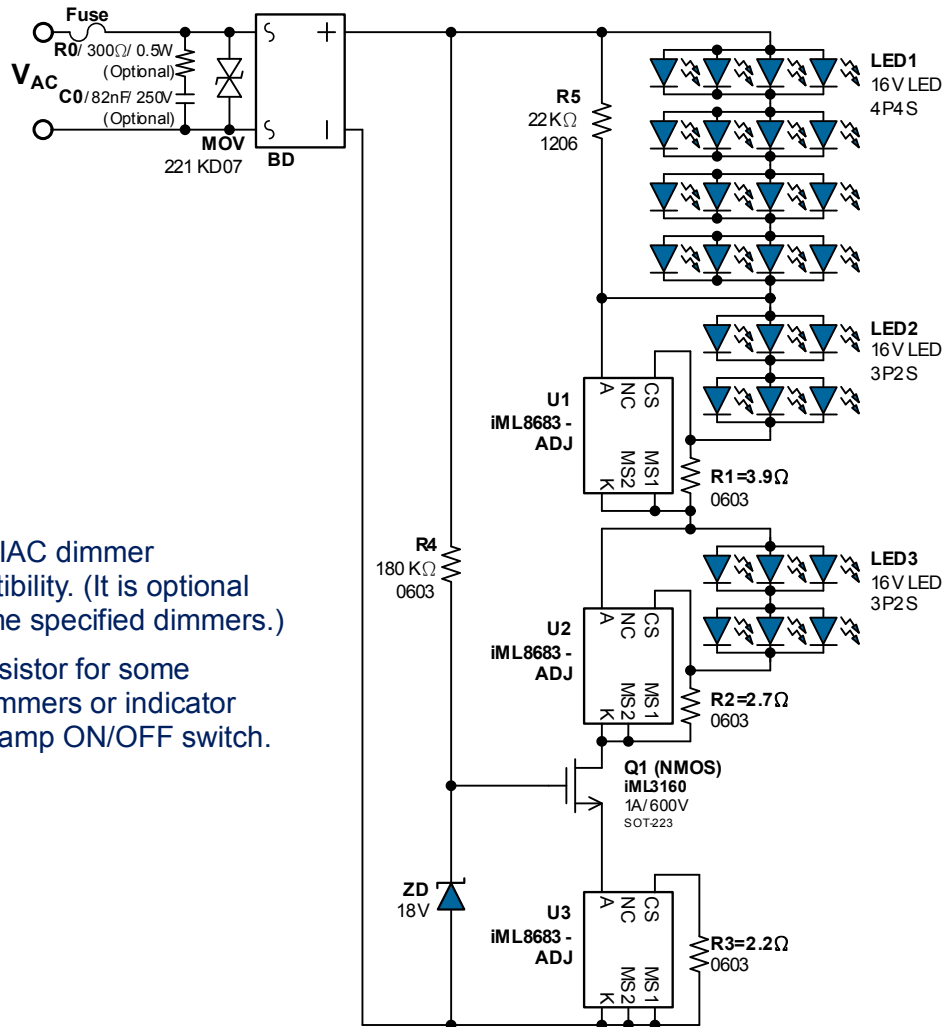
■ Applications

- ✓ AC LED lighting engine.
- ✓ LED light bulb.
- ✓ LED light tube.

3. Package and Pin Diagrams



4. Application Circuit

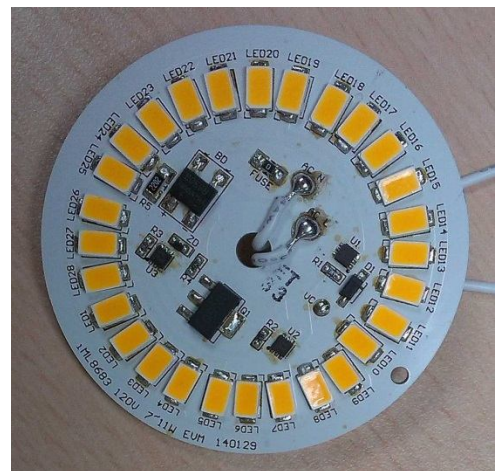
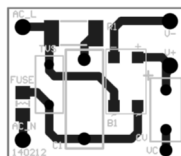
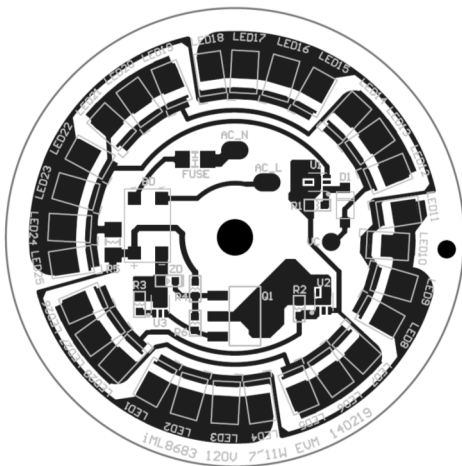


Remark:

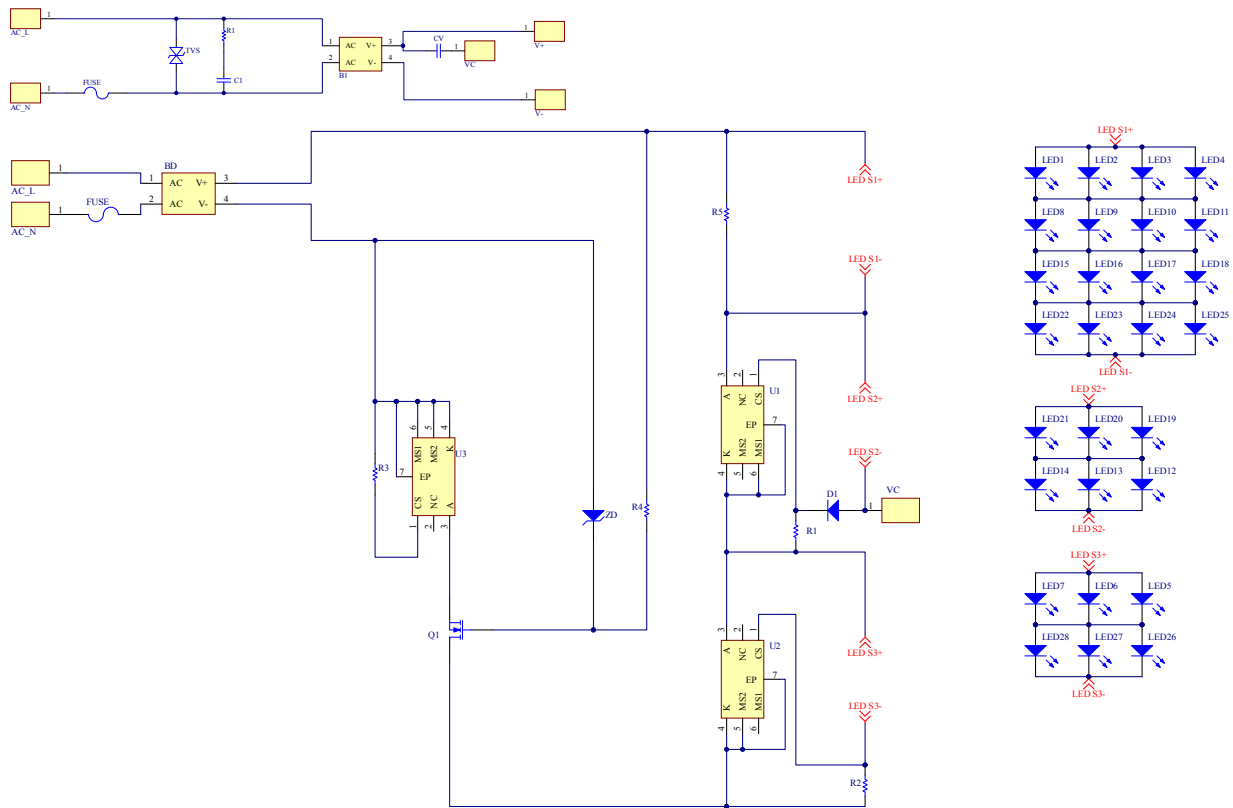
R0/C0: For TRIAC dimmer compatibility. (It is optional for some specified dimmers.)

R5: Bleeder resistor for some specific dimmers or indicator lamp in a lamp ON/OFF switch.

5. PCB Layout and Photograph



6. Schematic of PCB



7. Bill of Materials

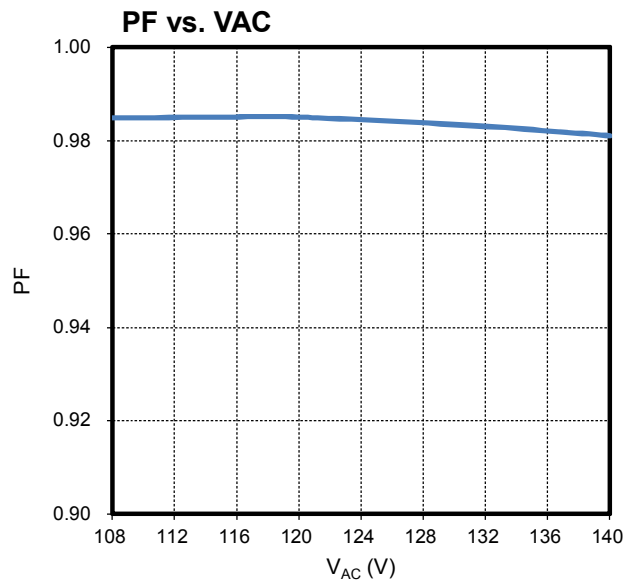
Component	Description	Package
Main Board		
Fuse	NC (0Ω)	1206
BD	Bridge Diode, MDB10S, 1000V, 1A	
U1, U2, U3	iML8683NL-ADJ	DFN-2x2 6L
LED1 ~ LED28	Edison, 16V LED (CCT=3000K)	5630
R1	Resistor, 3.9Ω	0603
R2	Resistor, 2.7Ω	0603
R3	Resistor, 2.2Ω	0603
R4	Resistor, 180KΩ	0603
R5	Resistor, 22KΩ	1206
D1	80V/0.5A Schottky Diode, MBR 0580-TP	SOD-123
ZD	Zener Diode, 18V	SOD-523
Q1	HV NMOS, iML3160, 600V/1A, V _{GS,MAX} =30V	SOT-223
Front End Board		
Fuse	NC (0Ω)	1206
MOV	221K7D	Φ 7mm
R1	Resistor, 300Ω	0.5W
C1	82nF/250V	Mylar Capacitor
BD	NC	
CV	NC	E. Cap

8. Performance Data and Typical Characteristic

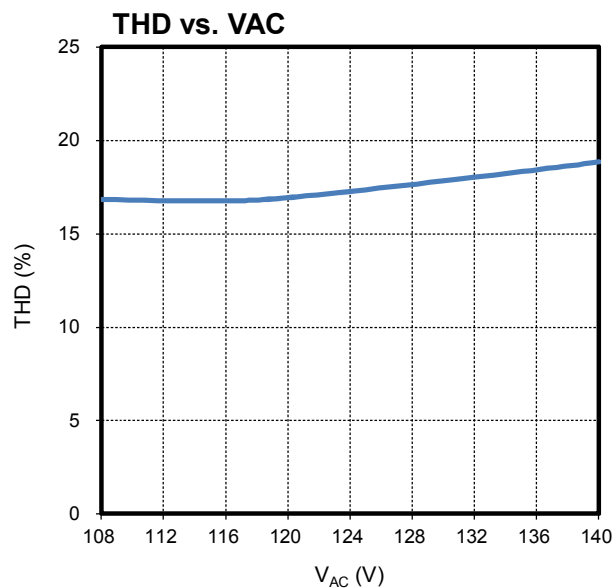
8.1 Test result

V _{AC} (V)	I _{IN} (mA)	PF	THD (%)	P _{IN} (W)	I _{IN} Line Reg.
108	89.57	0.985	16.83	9.592	-4.11%
115	91.96	0.985	16.75	10.477	-1.55%
120	93.41	0.985	16.93	11.098	0.00%
132	96.24	0.983	18.02	12.547	3.03%
140	97.87	0.981	18.84	13.515	4.77%

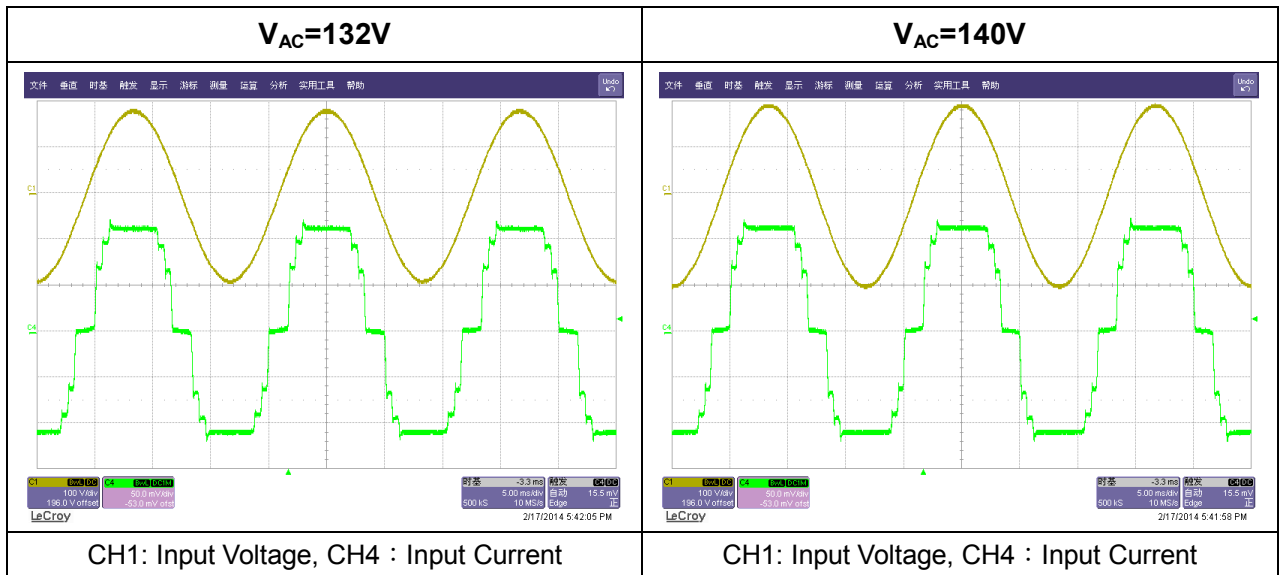
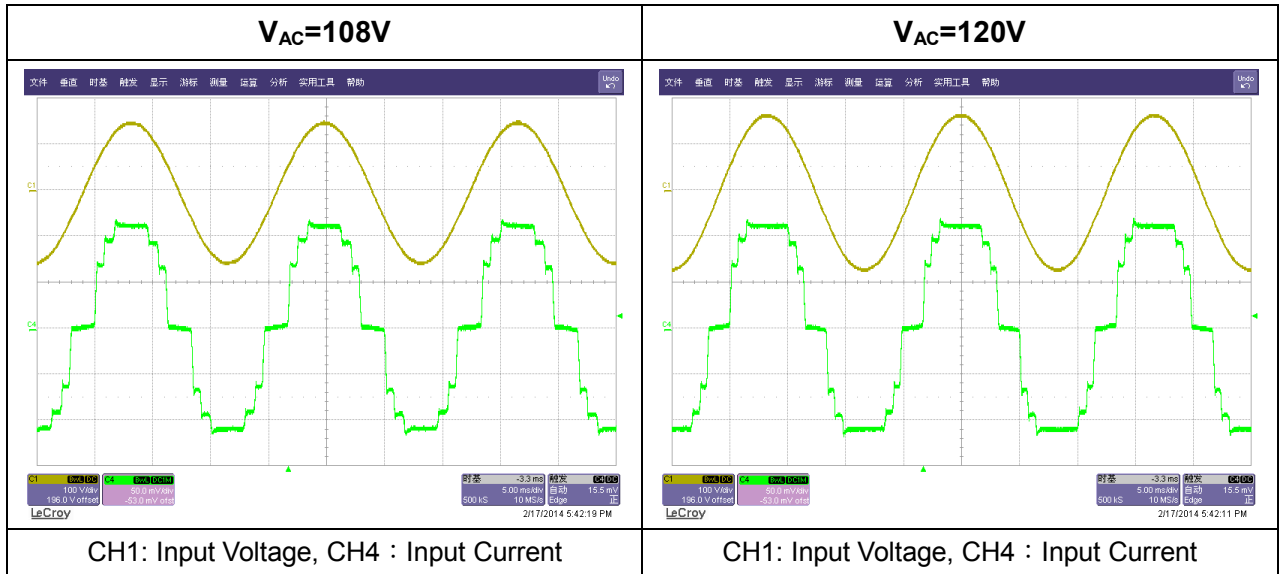
8.2 Power Factor vs. V_{AC}



8.3 THD vs. V_{AC}

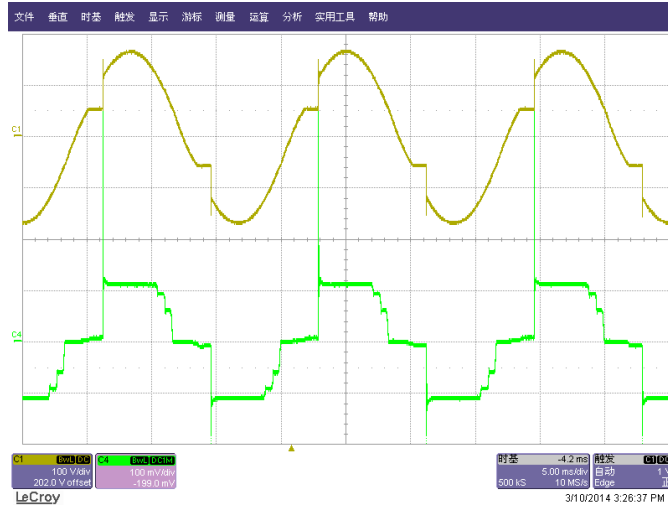


8.4 Input Voltage and Input Current

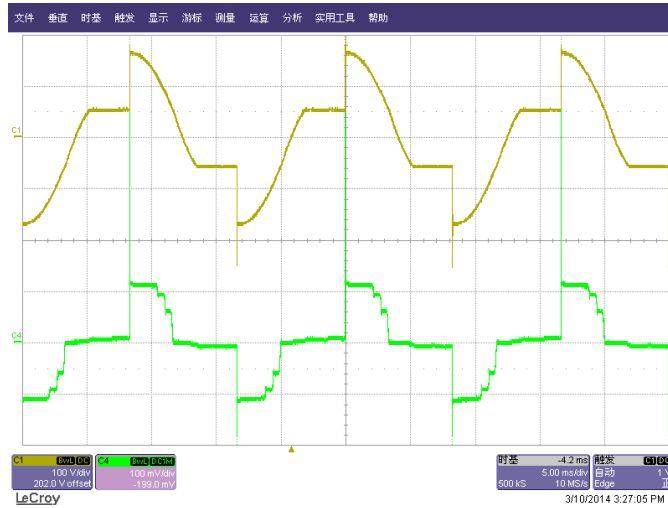


8.5 TRIAC Dimming Waveforms

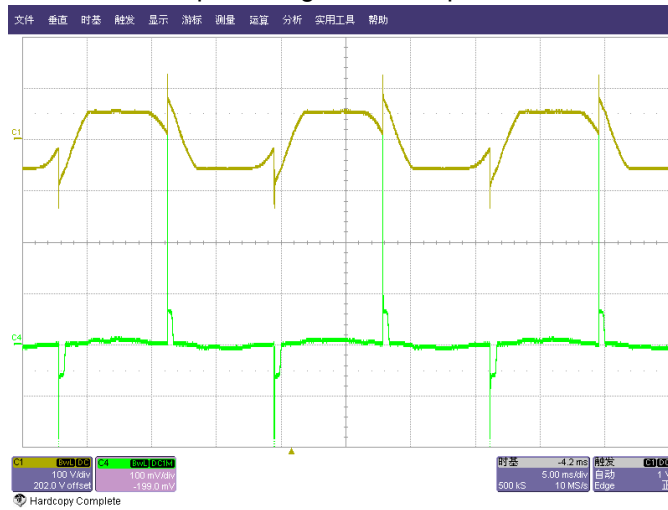
8.5.1 Leading Phase TRIAC Dimming



CH1: Input Voltage, CH4 : Input Current



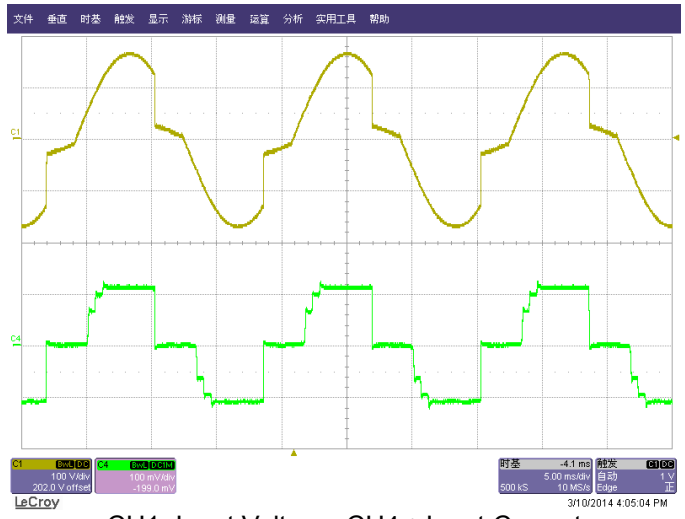
CH1: Input Voltage, CH4 : Input Current



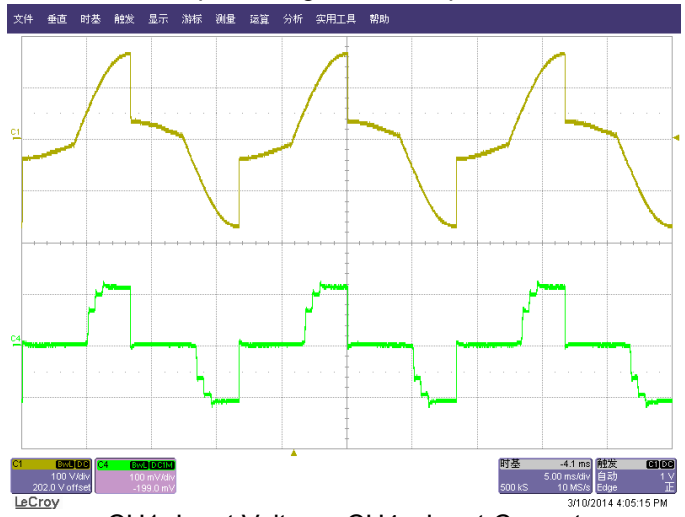
CH1: Input Voltage, CH4 : Input Current

<< Note : TRIAC Dimmer (Leviton-Illumatech-IP106-1LZ) >>

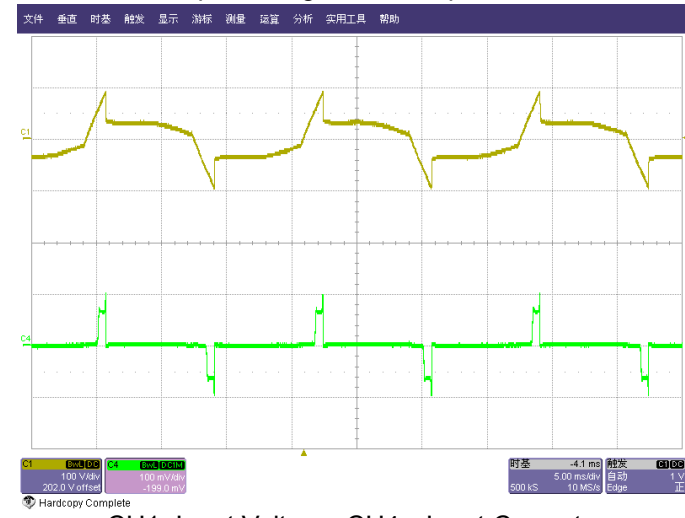
8.5.2 Trailing Phase TRIAC Dimming



CH1: Input Voltage, CH4 : Input Current



CH1: Input Voltage, CH4 : Input Current



CH1: Input Voltage, CH4 : Input Current

<< Note : TRIAC Dimmer (LUTRON- DIVA- DVELV-300P) >>

8.5.3 Compatible Dimmers

Brands	Series	Model	Voltage	Power	Type
Leviton	Illumatech	IP106-1LZ	120V	600W	Leading
Leviton	Decora	6633-PL	120V	600W	Leading
Leviton	Decora	6615-P	120V	300W	Trailing
LUTRON	DIVA	DVCL-153P	120V	600W	Leading
LUTRON	DIVA	DV-600P-IV	120V	600W	Leading
LUTRON	DIVA	DVELV-300P	120V	300W	Trailing
LUTRON	Ariadni	AY-600P-IV	120V	600W	Leading
LUTRON	Nova	N-600-AL	120V	600W	Leading
LUTRON	Skylark	CT-600P	120V	600W	Leading
LUTRON	Skylark	CTCL-153P	120V	600W	Leading

9. Surge Performance

In order to pass 1KV surge test (IEC61000-4-5), a MOV is required. Without MOV, the light engine can pass 750V surge. Here are the test results.



Worldwide Testing Services(Taiwan) Co., Ltd.

Surge

Applicant: Integrated Memory Logic, Inc.

Standard: EN 61000 - 4 - 5

Device: iML8683 120V/ 11W LED Bulb Module

Date: 2014.03.04

Temperature	: 22.4 °C
Pressure	: 990 hPa
Rel. humidity	: 49.4 %

Model	Test mode	Voltage Angle	Waveform T _r / T _b	Repetition	Number of Tests/ Total	Performance criteria
#1	120VAC-line to line	+500V 90°	1.2/50 μs	30s	5/5	A
		-500V 270°	1.2/50 μs	30s	5/5	A
#2	120VAC-line to line	+750V 90°	1.2/50 μs	30s	5/5	A
		-750V 270°	1.2/50 μs	30s	5/5	A
#3 MOV221	120VAC-line to line	+1000V 90°	1.2/50 μs	30s	5/5	A
		-1000V 270°	1.2/50 μs	30s	5/5	A

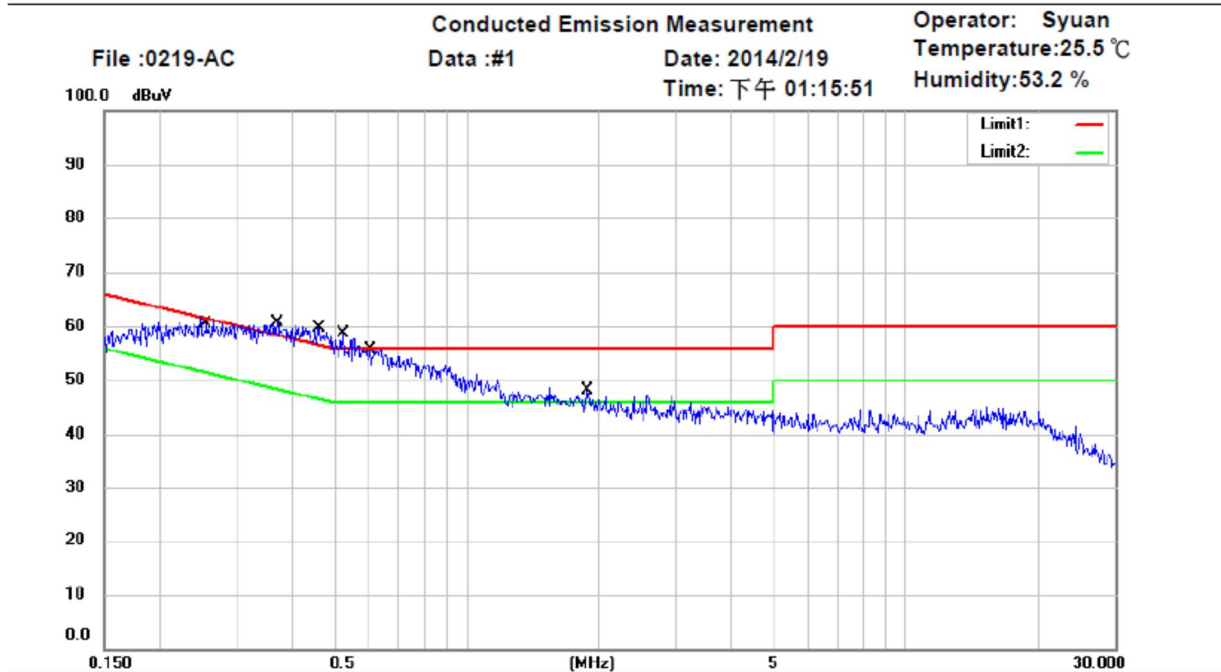
Performance criteria:

- A : No loss of performance or function
- B : Temporary loss of function or performance which is self recoverable
- C : Temporary loss of function or perform. which req. operate. intervention or system reset
- D : Loss of function which is not recoverable

10. EMI Performance



Address: 6F., No. 58, Ln 188, Ruey Kuang Rd, Neihu, Taipei
Tel: +886-2-6606-8877
Fax: +886-2-6606-8875



Site : Chamber_03

Condition : FCC Part 15 Class B Conduction (QP)

Phase: L1

EUT :

Power : 120 Va.c.

M/N: iML 8683 120V/11W LED Bulb Module

Test Mode :

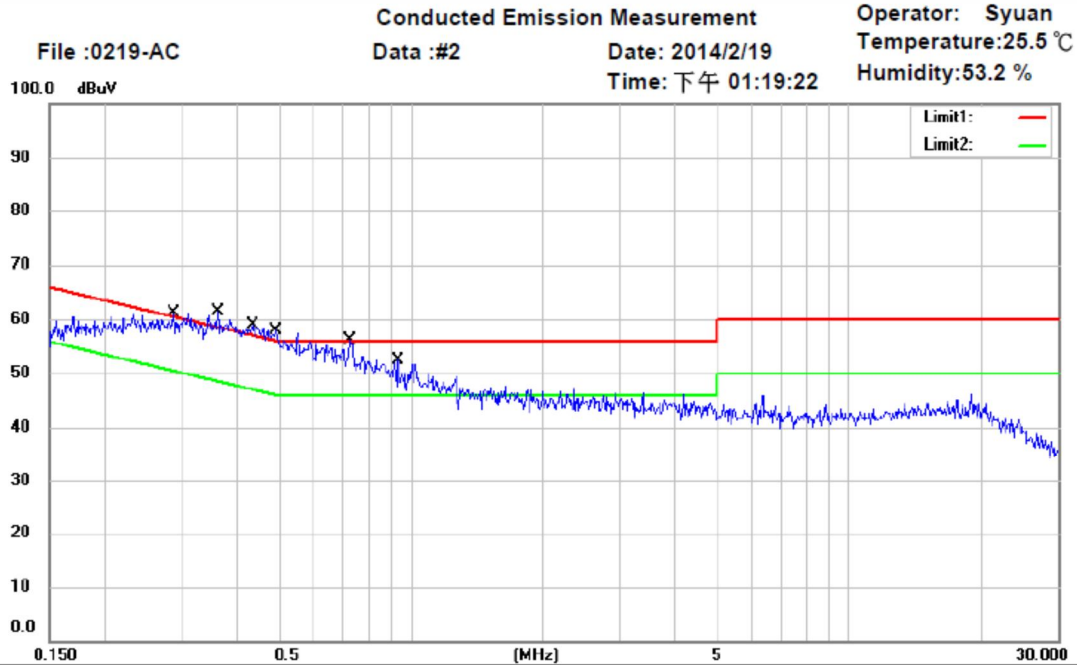
Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.2525	43.66	QP	9.65	53.31	61.67	-8.36	
	0.2525	32.50	AVG	9.65	42.15	51.67	-9.52	
	0.3688	43.37	QP	9.65	53.02	58.53	-5.51	
	0.3688	31.88	AVG	9.65	41.53	48.53	-7.00	
*	0.4613	42.34	QP	9.56	51.90	56.67	-4.77	
	0.4613	30.85	AVG	9.56	40.41	46.67	-6.26	
	0.5300	41.25	QP	9.66	50.91	56.00	-5.09	
	0.5300	29.68	AVG	9.66	39.34	46.00	-6.66	
	0.6042	40.34	QP	9.67	50.01	56.00	-5.99	
	0.6042	28.46	AVG	9.67	38.13	46.00	-7.87	
	1.8951	30.00	QP	9.71	39.71	56.00	-16.29	
	1.8951	17.99	AVG	9.71	27.70	46.00	-18.30	

*:Maximum data x:Over limit !:over margin



Address: 6F., No. 58, Ln 188, Ruey Kuang Rd, Neihu, Taipei
 Tel: +886-2-6606-8877
 Fax: +886-2-6606-8875



Site : Chamber_03
 Condition : FCC Part 15 Class B Conduction (QP) Phase: N
 EUT : Power : 120 Va.c.
 M/N: iML 8683 120V/11W LED Bulb Module
 Test Mode :
 Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.2868	43.62	QP	9.66	53.28	60.62	-7.34	
	0.2868	32.22	AVG	9.66	41.88	50.62	-8.74	
	0.3655	43.03	QP	9.66	52.69	58.60	-5.91	
	0.3655	31.50	AVG	9.66	41.16	48.60	-7.44	
	0.4394	42.34	QP	9.57	51.91	57.07	-5.16	
	0.4394	30.78	AVG	9.57	40.35	47.07	-6.72	
*	0.4992	41.62	QP	9.67	51.29	56.01	-4.72	
	0.4992	29.97	AVG	9.67	39.64	46.01	-6.37	
	0.7310	38.16	QP	9.68	47.84	56.00	-8.16	
	0.7310	26.50	AVG	9.68	36.18	46.00	-9.82	
	0.9333	35.16	QP	9.69	44.85	56.00	-11.15	
	0.9333	23.35	AVG	9.69	33.04	46.00	-12.96	

*:Maximum data x:Over limit !:over margin