

# **iML8683 – 220V<sub>AC</sub> 10W 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 <sub>AC</sub> .....	5
8.3 THD vs. V <sub>AC</sub> .....	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

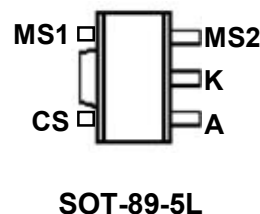
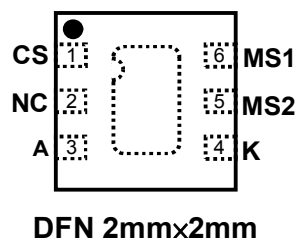
### ■ Chip

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

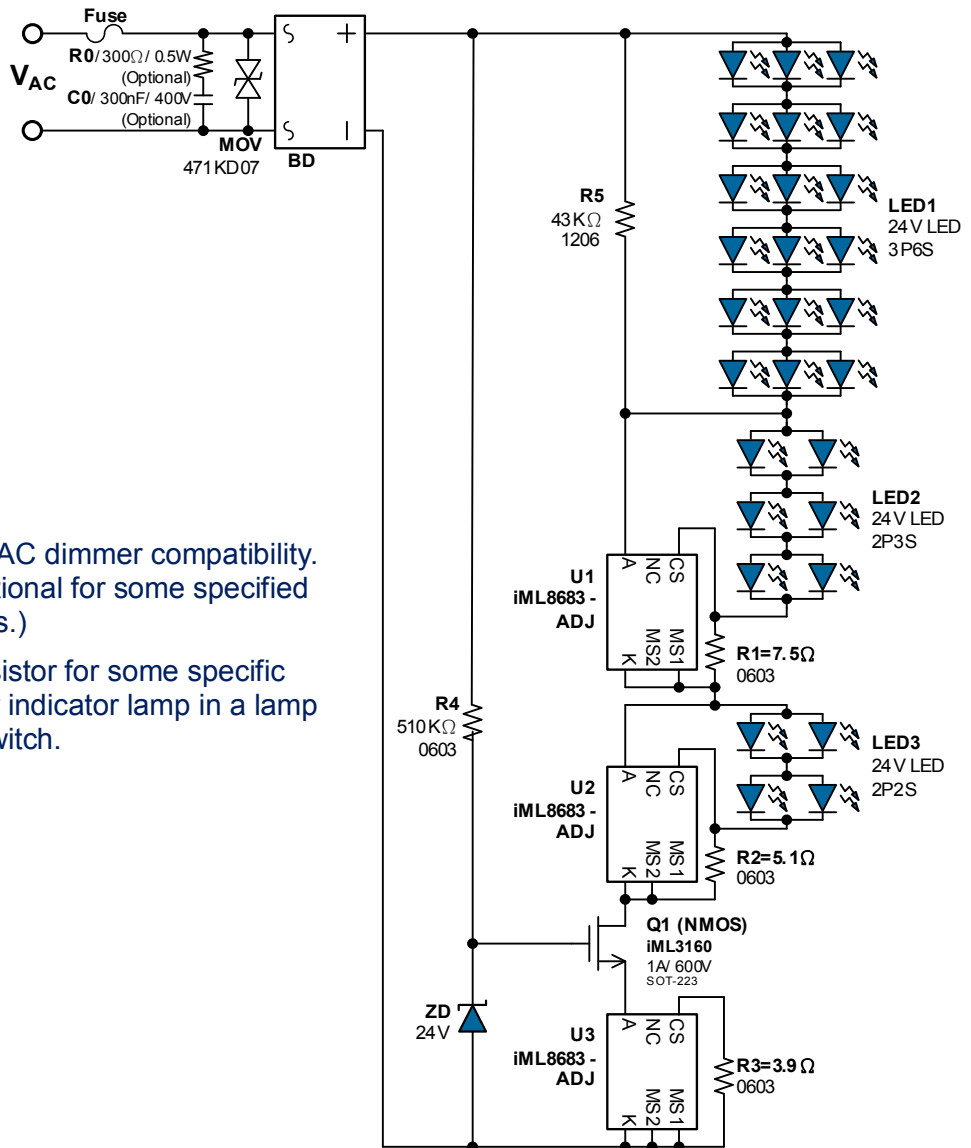
### ■ Applications

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

## 3. Package and Pin Diagrams



### 4. Application Circuit

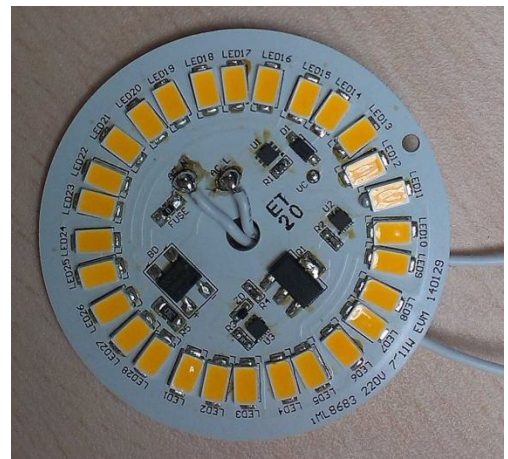
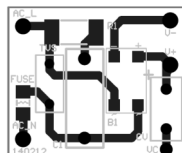
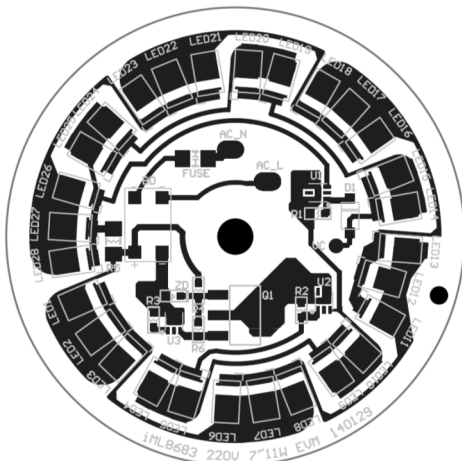


**Remark:**

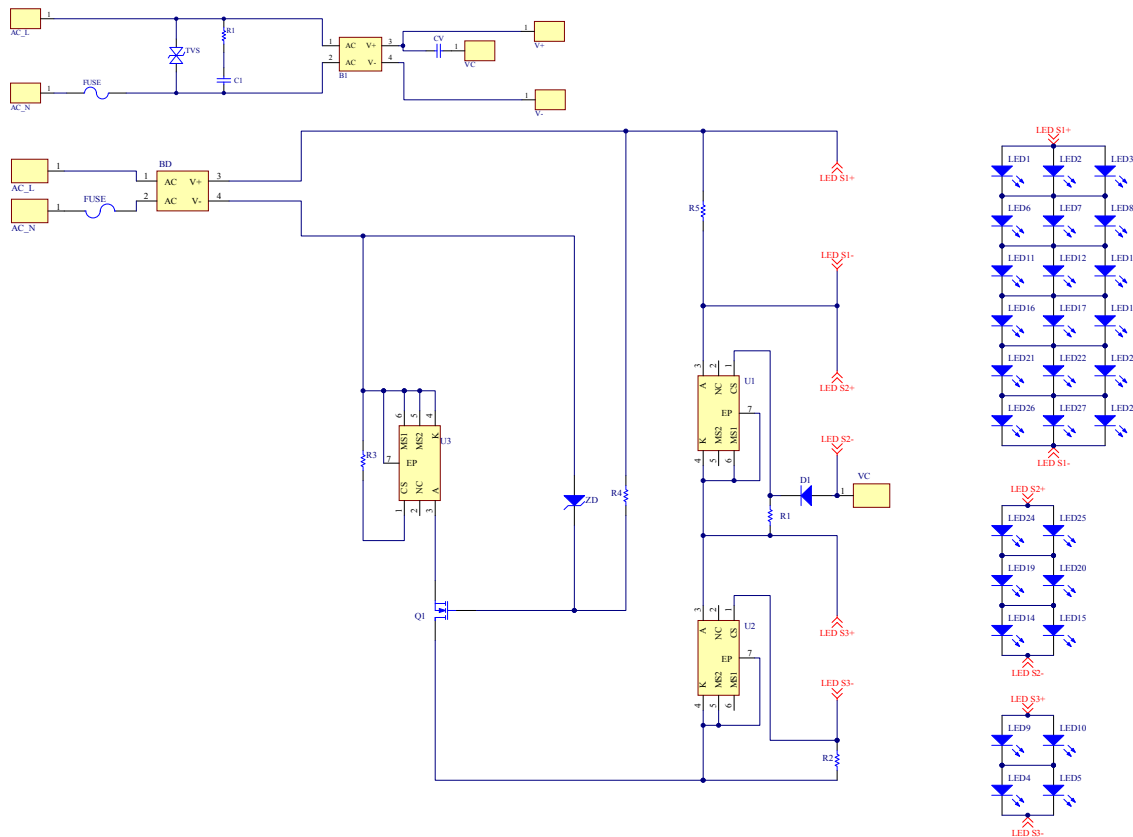
**R0/C0:** For TRIAC dimmer compatibility. (It is optional for some specified dimmers.)

**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

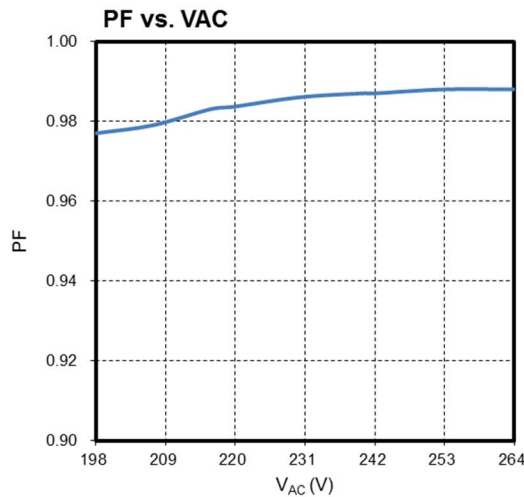
Component	Description	Package
<b>Main Board</b>		
Fuse	NC (0Ω)	1206
BD	Bridge Diode, MDB10S, 1000V, 1A	
U1, U2, U3	iML8683NL-ADJ	DFN-2x2 6L
LED1 ~ LED28	Edison, 24V LED (CCT=3000K)	5630
R1	Resistor, 7.5Ω	0603
R2	Resistor, 5.1Ω	0603
R3	Resistor, 3.9Ω	0603
R4	Resistor, 510KΩ	0603
R5	Resistor, 43KΩ	1206
D1	80V/0.5A Schottky Diode, MBR 0580-TP	SOD-123
ZD	Zener Diode, 24V	SOD-523
Q1	HV NMOS, iML3160, 600V/1A, V <sub>GS,MAX</sub> =30V	SOT-223
<b>Front End Board</b>		
Fuse	NC (0Ω)	1206
MOV	471K7D	Φ 7mm
R1	Resistor, 300Ω	0.5W
C1	300nF/400V	Mylar Capacitor
BD	NC	
CV	NC	E. Cap

## 8. Performance Data and Typical Characteristic

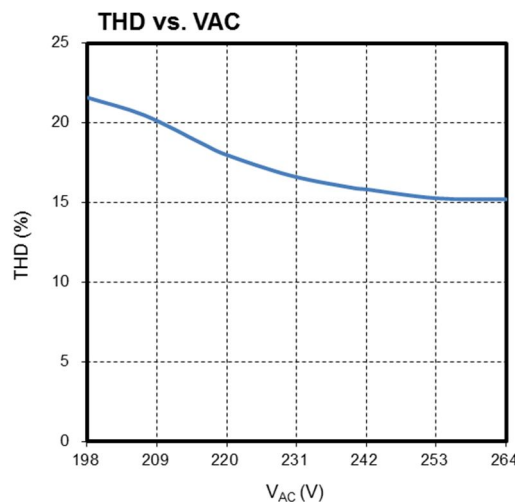
### 8.1 Test Result

V <sub>AC</sub> (V)	I <sub>IN</sub> (mA)	PF	THD (%)	P <sub>IN</sub> (W)	I <sub>IN</sub> Line Reg.
198	41.66	0.977	21.59	8.129	-13.11%
207	45.30	0.979	20.48	9.233	-5.53%
216	47.18	0.983	18.72	10.075	-1.60%
220	47.95	0.984	17.98	10.440	0.00%
230	49.51	0.986	16.69	11.284	3.25%
240	50.76	0.987	15.90	12.089	5.86%
242	50.93	0.987	15.82	12.180	6.22%
253	52.17	0.988	15.26	13.104	8.81%
264	53.09	0.988	15.19	13.860	10.72%

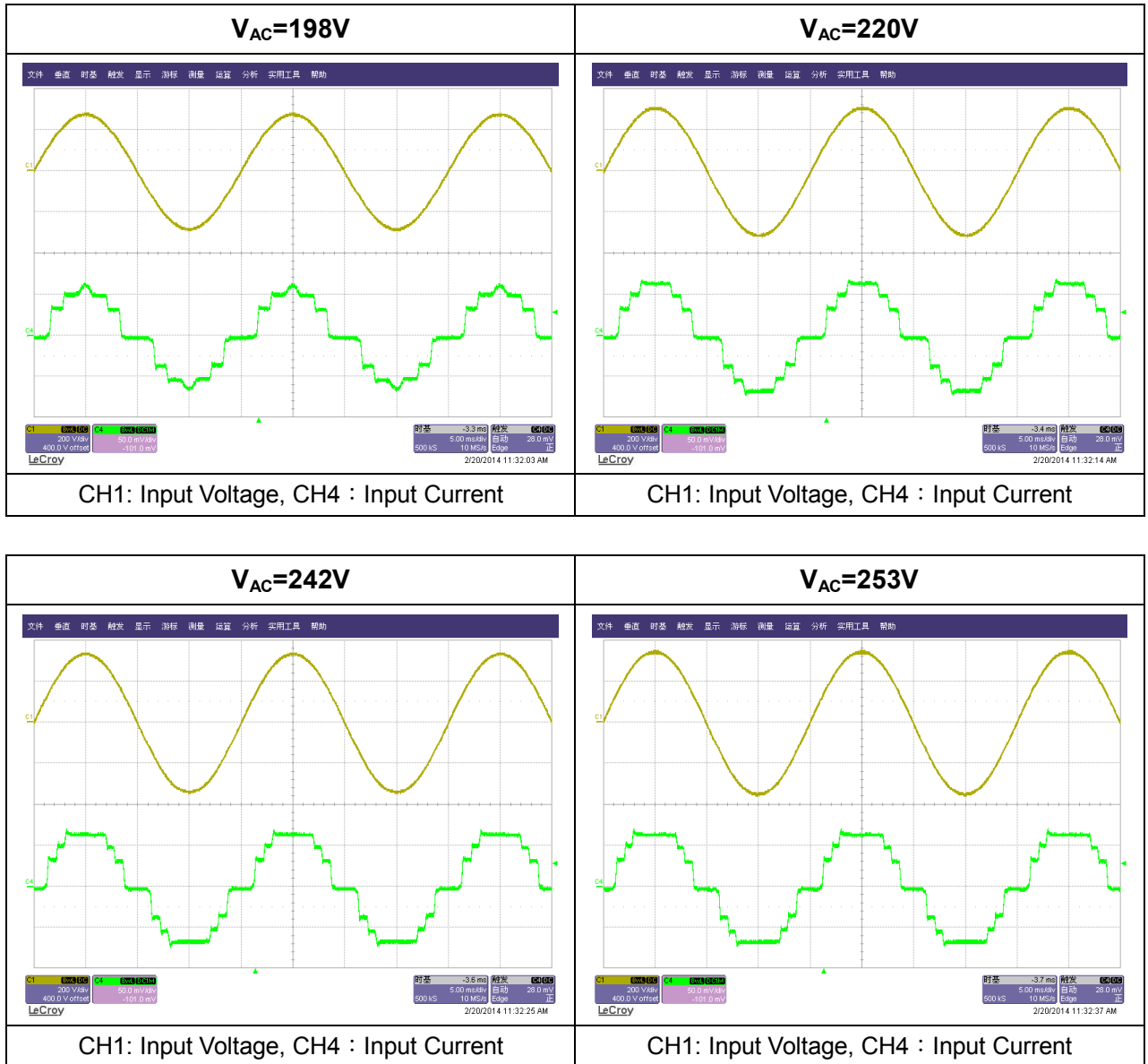
### 8.2 Power Factor vs. V<sub>AC</sub>



### 8.3 THD vs. V<sub>AC</sub>

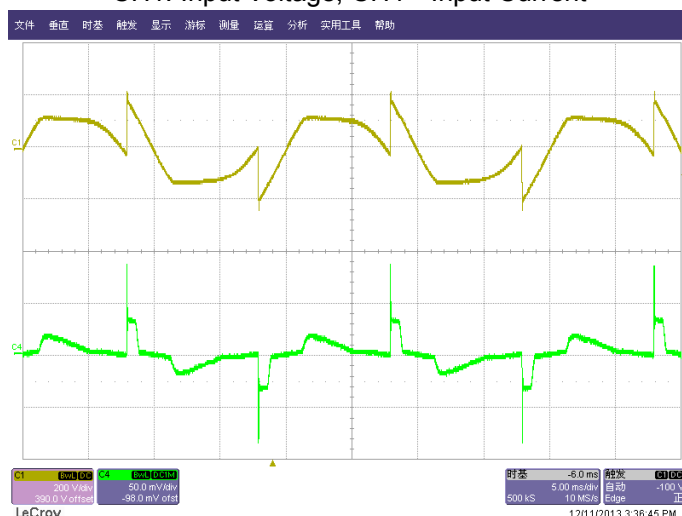
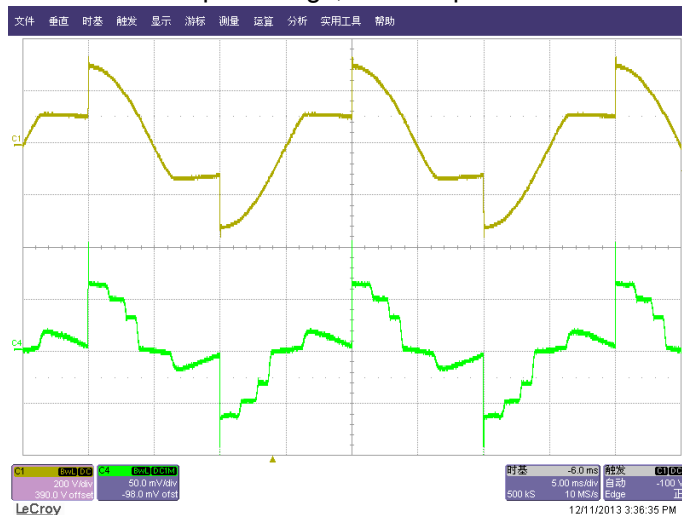
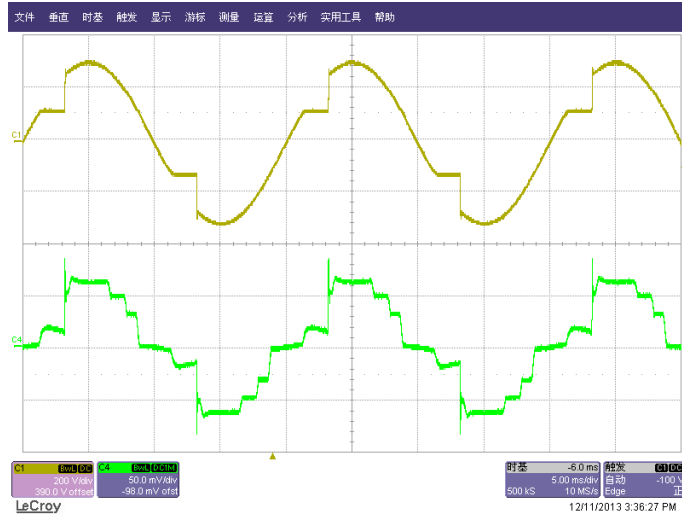


### 8.4 Input Voltage and Input Current



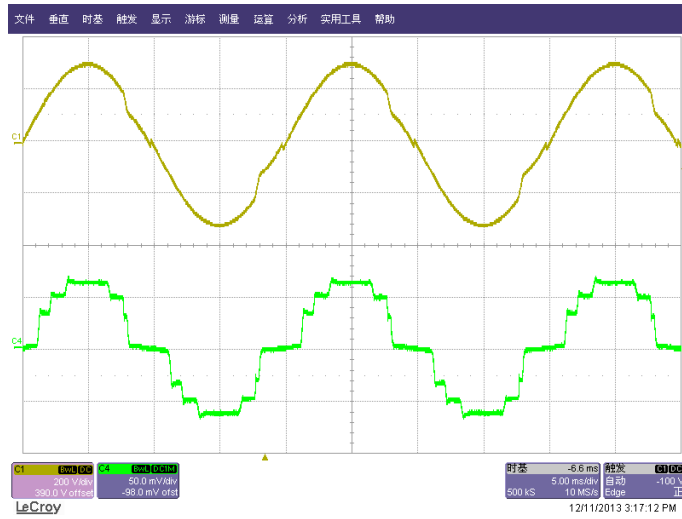
## 8.5 TRIAC Dimming Waveforms

### 8.5.1 Leading Phase TRIAC Dimming

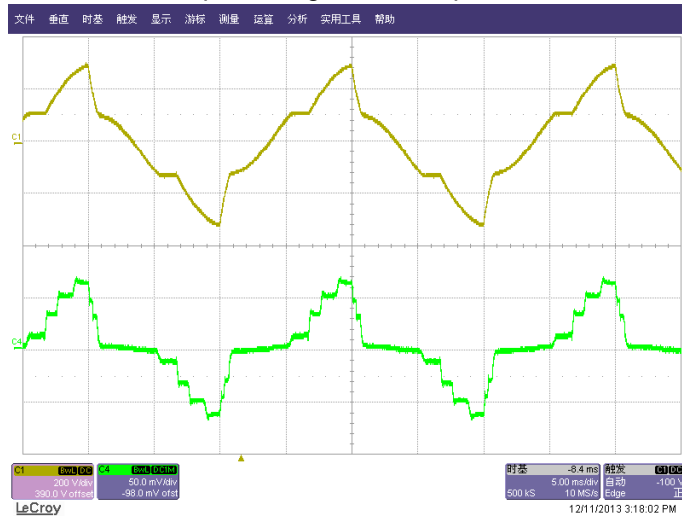


<< Note : TRIAC Dimmer (Busch-Jaeger 2247U) >>

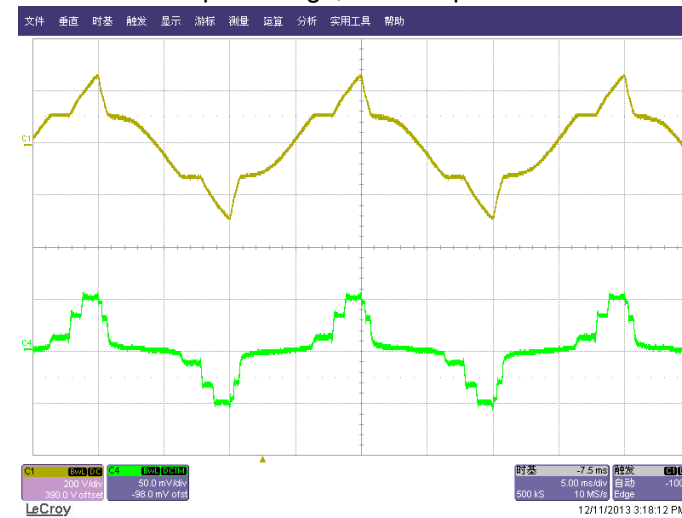
### 8.5.2 Trailing Phase TRIAC Dimming



CH1: Input Voltage, CH4 : Input Current



CH1: Input Voltage, CH4 : Input Current



CH1: Input Voltage, CH4 : Input Current

<< Note : TRIAC Dimmer (Busch-Jaeger 6513U) >>



### 8.5.3 Compatible Dimmers

Brands	Model	Voltage	Power	Type
Busch-Jaeger	2250U	220V	600W	Leading
Busch-Jaeger	2247U	220V	500W	Leading
Busch-Jaeger	6513U	220V	420W	Trailing
GIRA	0300-00	220V	400W	Leading
GIRA	0307-00/102	220V	400W	Trailing
NAM	ASW 3701	220V	700W	Leading
NAM	ASW 3000	220V	1000W	Leading
SIEMENS	DELTA Vista	220V	500W	Leading
TCL	Legrand	220V	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 220V/ 10W LED Bulb Module

Date: 2014.03.05

Temperature	: 24.8 °C
Pressure	: 990 hPa
Rel. humidity	: 47.6 %

Model	Test mode	Voltage Angle	Waveform T <sub>r</sub> / T <sub>b</sub>	Repetition	Number of Tests/ Total	Performance criteria
#1	220VAC-line to line	+500V 90°	1.2/50 μs	30s	5/5	A
		-500V 270°	1.2/50 μs	30s	5/5	A
#2	220VAC-line to line	+750V 90°	1.2/50 μs	30s	5/5	A
		-750V 270°	1.2/50 μs	30s	5/5	A
#3 MOV471	220VAC-line to line	+1000V 90°	1.2/50 μs	30s	5/5	A
		-1000V 270°	1.2/50 μs	30s	5/5	A

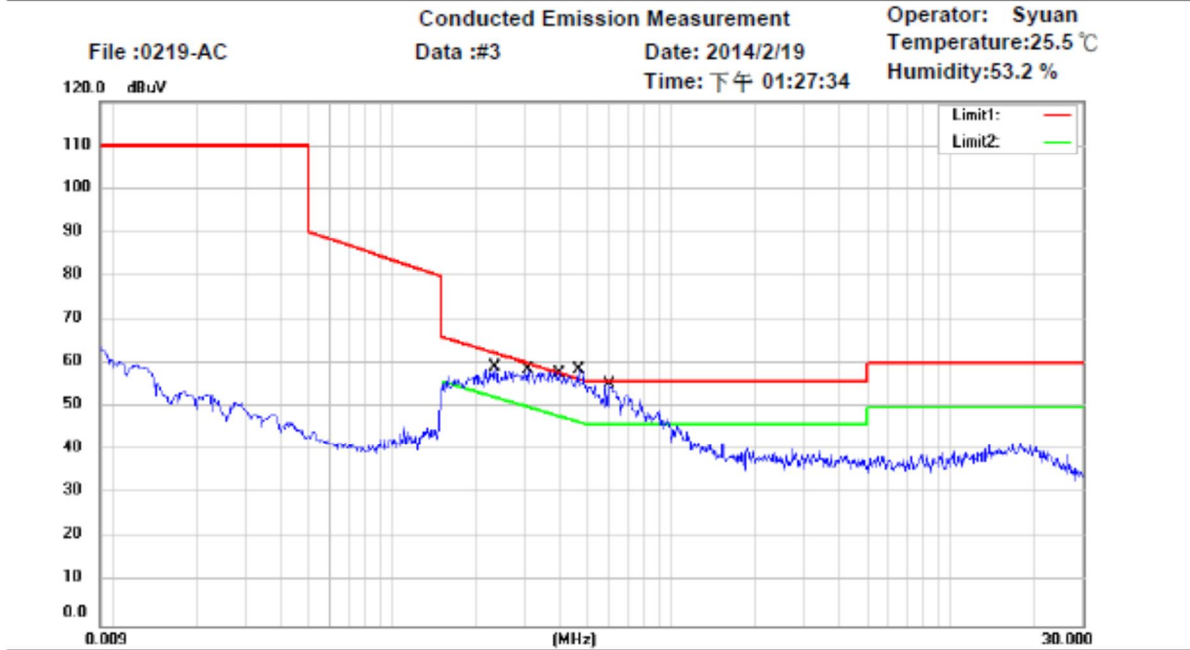
### Performance criteria:

- 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 : EN55015 Conduction(QP)

Phase: L1

EUT :

Power : 220 V.a.c.

M/N: iML 8683 220V/10W LED Bulb Module

Test Mode :

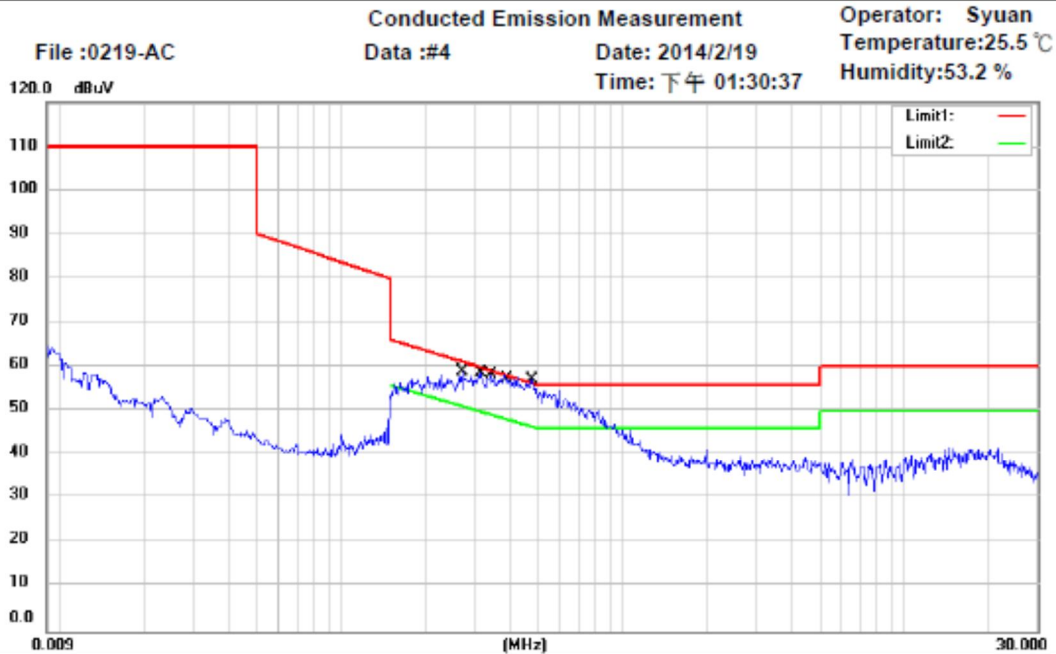
Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.2360	40.76	QP	9.65	50.41	62.24	-11.83	
	0.2360	27.26	AVG	9.65	36.91	52.24	-15.33	
	0.3096	40.78	QP	9.65	50.43	59.98	-9.55	
	0.3096	27.22	AVG	9.65	36.87	49.98	-13.11	
	0.3917	40.40	QP	9.65	50.05	58.03	-7.98	
	0.3917	26.45	AVG	9.65	36.10	48.03	-11.93	
*	0.4658	39.37	QP	9.57	48.94	56.59	-7.65	
	0.4658	25.62	AVG	9.57	35.19	46.59	-11.40	
	0.6058	37.52	QP	9.67	47.19	56.00	-8.81	
	0.6058	23.32	AVG	9.67	32.99	46.00	-13.01	

\*: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 : EN55015 Conduction(QP)

Phase: N

EUT :

Power : 220 V.a.c.

M/N: iML 8683 220V/10W LED Bulb Module

Test Mode :

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.2692	40.84	QP	9.66	50.50	61.14	-10.64	
	0.2692	27.26	AVG	9.66	36.92	51.14	-14.22	
	0.3153	40.87	QP	9.66	50.53	59.83	-9.30	
	0.3153	27.22	AVG	9.66	36.88	49.83	-12.95	
	0.3426	40.48	QP	9.66	50.14	59.14	-9.00	
	0.3426	26.94	AVG	9.66	36.60	49.14	-12.54	
	0.3884	40.23	QP	9.66	49.89	58.10	-8.21	
	0.3884	26.56	AVG	9.66	36.22	48.10	-11.88	
*	0.4707	39.35	QP	9.59	48.94	56.50	-7.56	
	0.4707	25.68	AVG	9.59	35.27	46.50	-11.23	

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