



O2 Micro LED Lighting Solution For Big-Bit Seminar

2017-05

Who we are

- 成立于**1995**年，全球领先的电源管理芯片提供商，致力于消费电子，计算机，工业/汽车，和通讯市场
- 致力于模拟/混合信号设计
- 被**IEEE**认定为电源管理领域专利领先厂商
- 被华尔街认定为绿色能源领先厂商
- 稳固的财务成长记录

美国**NASDAQ**上市公司

- 全球布局的国际化公司：
 - 开发团队位于中国，硅谷，新加坡和欧洲
 - 在中国，中国台湾，美国，日本和韩国 设有市场中心
 - 全球超过**800**名员工
 - 芯片生产协作厂商在亚洲和欧洲
 - 公司总部位于开曼群岛

Global Office



Market

Focus on fast growing market



Computer



Consumer



Industry



Communication

Customers

Leading Vendors in Consumer Electronics, Computer, Automotive and Communications Markets

FUJITSU COMPUTERS
SIEMENS

Gateway

DELL
acer

SAMSUNG

NEC

TOYOTA

SONY



BenQ

IBM

hp
invent

FOUNDER



NISSAN
PHILIPS

FUJITSU

SHARP

Sony Ericsson

LG

lenovo 联想
Legend Group Limited

FIC

ViewSonic

HITACHI

TOSHIBA

LED General Lighting Solution



LED lighting solution

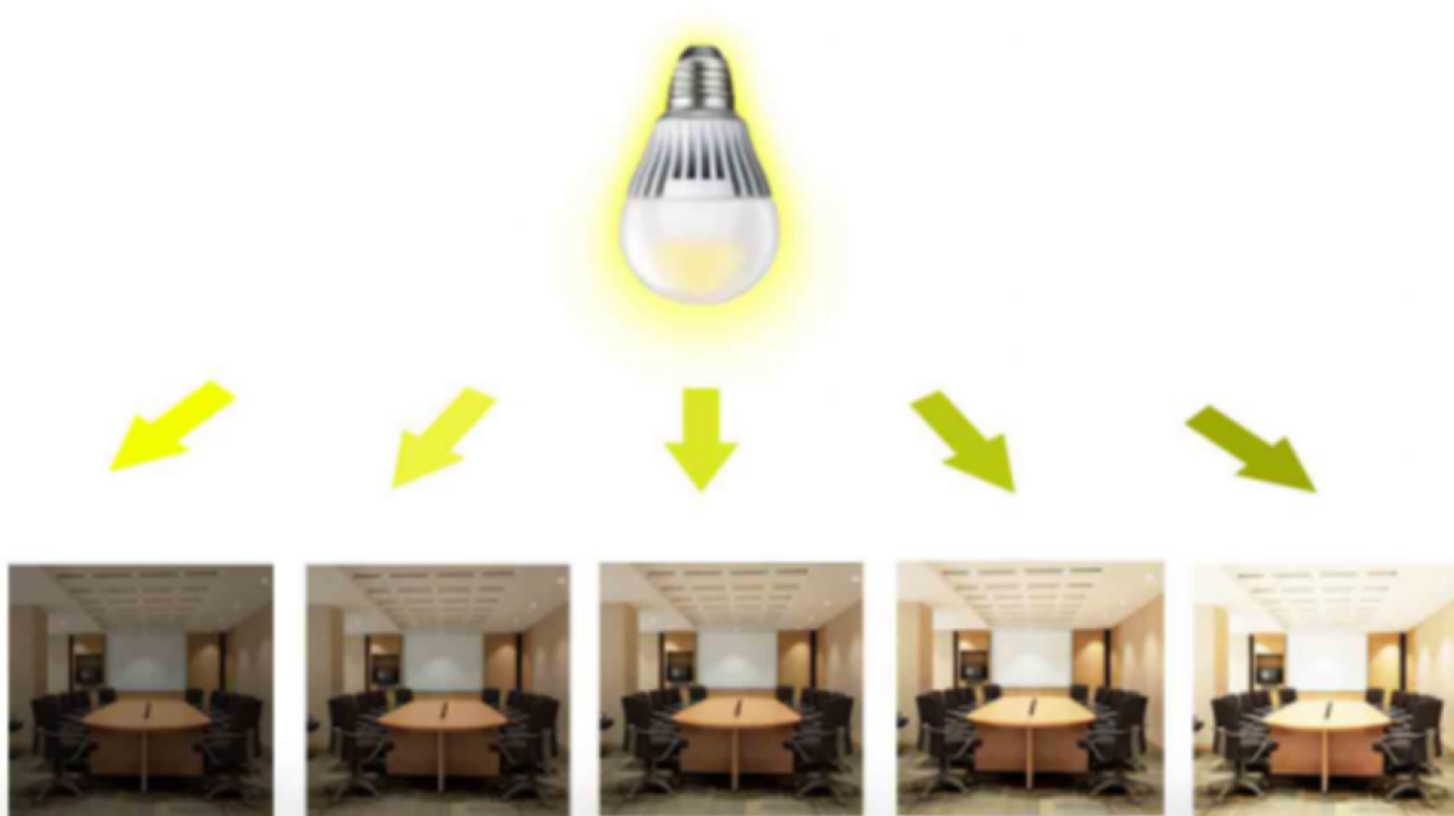
Dimming	Free dimming	分段调光 /OZ8022T	切色温 /OZ2082C	连续调光 /OZ8024X	三位调光 /OZ2083
	Triac dimming	欧洲澳洲亚太 /OZ2095	北美 /OZ2096	Sunset lamp/OZ8020A	Filament lamp/OZ2092
	0-10V dimming	单串/OZ2081	2-6串/OZ56X		
	Intelligent dimming	调光调色 /OZ2089	调光调色 /OZ562		
Non-dimming	Isolated	PSR恒流 /OZ8027V	恒压 /OZ8023		
	Non-Isolated/high PF	外置 MOS/OZ8022V	外置MOS /OZ8022VT	内置MOS /OZ8022VTX	
	Non-Isolated/low PF	外置 MOS/OZ8022			
	Non-Isolated/linear	欧洲澳洲亚太 /OZ8020	北美日本 /OZ8020A		
DC/DC	升压	内置/OZ521	外置/OZ2091	外置/OZ9902C	
	降压	内置/OZ533	外置/OZ562		

Free dimming Products



Free Dimming

墙壁开关 智能调光
使用墙面上原有的开关 即可改变LED灯的亮度



Free dimming products – 3 level dimming

3-Level Dimming

通过墙壁开关(开/关)
选择全亮 半亮 微亮



Free dimming products – 3 level dimming

Part No.	OZ8022A/ OZ8022B	OZ8022M	OZ8022AM	OZ8022T
Topology	Buck	Buck	Buck	Buck/Buck-Boost
High PF	-	-	-	Yes
3-level dimmer	100%-60%-20% 20%-60%-100%	100%-40%-2.5%	100%-60%-20%	100%-40%-12.5%
Isolated	No	No	No	No
Operating frequency	Variable frequency	Variable frequency	Variable frequency	Variable frequency
Inductor or XFM current	CRM & DCM	CRM & DCM	CRM & DCM	CRM & DCM
Power MOSFET	External	External	Internal (600V)	External
Protection	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP
Package	SOT-23-6	SOT-23-6	SOP-8	SOP-8/QFN-16
MP	2010 Q4	2011 Q2	2011 Q3	2012 Q4

Free dimming products – Strong Patent

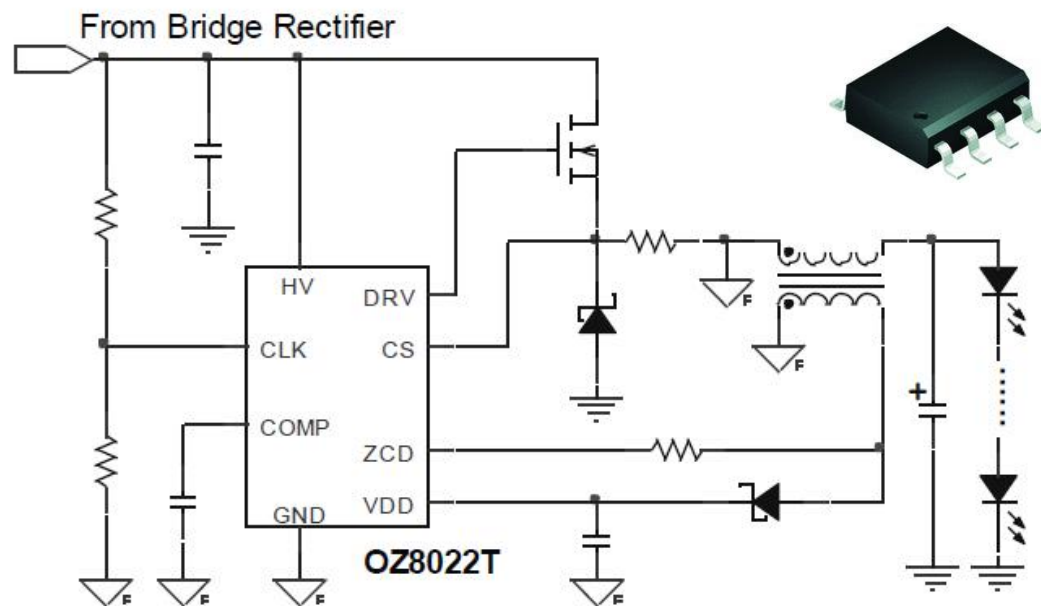
1. US 8,339,063
2. US 8,664,895
3. US 8,890,440
4. US 8,698,419
5. China 201010119888.2
6. China CN 102523661 B
7. Europe 2364061 (including UK and Germany)
8. Taiwan I381625
9. Taiwan I519200



Free dimming products – 3 level dimming high PF

特点:

- 现有开关即可实现调光，最低成本的调光方式
- 多灯并联一致性好
- 内置高压启动，全电压范围内启动时间<500ms
- 专利保护
- 支持宽范围输入电压
- $\pm 5\%$ LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护功能
- 封装：S0-8



✓ 支持buck和buck-boost拓扑，其中buck-boost拓扑谐波可以过IEC61000-3-2标准

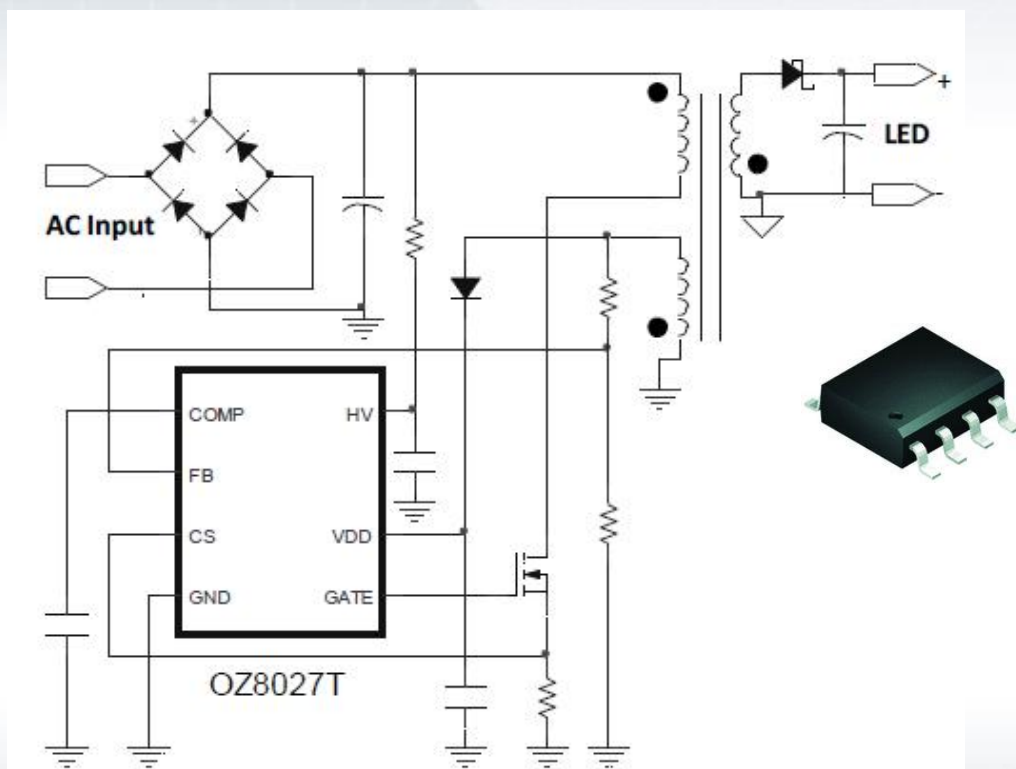
Free dimming products – 3 level dimming insulate

Part No.	OZ8027A	OZ8027T
Topology	Flyback/buckboost	Flyback/buckboost
High PF	Yes	Yes
3-level analog dimmer	100%-40%-20%	100%-40%-10%
Isolated	Yes	Yes
Operating frequency	Constant frequency (50kHz)	Constant frequency (67kHz)
XFM current	DCM	DCM
Power switch	External	External
Protection	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP
Package	SOP-8	SOP-8
MP	2012 Q2	2013 Q2

Free dimming products – 3 level dimming

特点:

- 现有开关即可实现调光，最低成本的调光方式
- 多灯并联一致性好
- 内置高压启动，全电压范围内启动时间<500ms
- 专利保护
- 支持宽范围输入电压
- $\pm 5\%$ LED输出电流精度
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- LED电压开路保护
- 过温保护功能
- 封装：S0-8



✓ 支持flyback和buck-boost拓扑，全电压范围内总谐波<10%，分次谐波过IEC61000-3-2标准。

Free dimming products – continues dimming

Continuous Dimming

通过墙壁开关(开/关)
选择任意亮度



3%

100%

CHARGER

Free dimming products – continues dimming

Part No.	OZ8024	OZ8024R	OZ8024A	OZ8024S
Topology	Buck	Buck	Buck/Buck-Boost	Buck/Buck-Boost
High PF	-	-	Yes	Yes
Continuous dimmer	PWM (100% to 3%)	PWM (3% to 100%)	Analog 5s (100% to 5%)	Analog 8s (5% to 100%)
Isolated	No	No	No	No
Operating frequency	Variable frequency	Variable frequency	Variable frequency	Variable frequency
Inductor or XFM current	CRM & DCM	CRM & DCM	CRM & DCM	CRM & DCM
Power MOSFET	External	External	External	External
Protection	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP
Package	SOP-8/QFN16	SOP-8/QFN16	SOP-8	SOP-8
MP	2012 Q3	2012 Q3	2013 Q2	2013 Q2

Free dimming products – Strong Patent

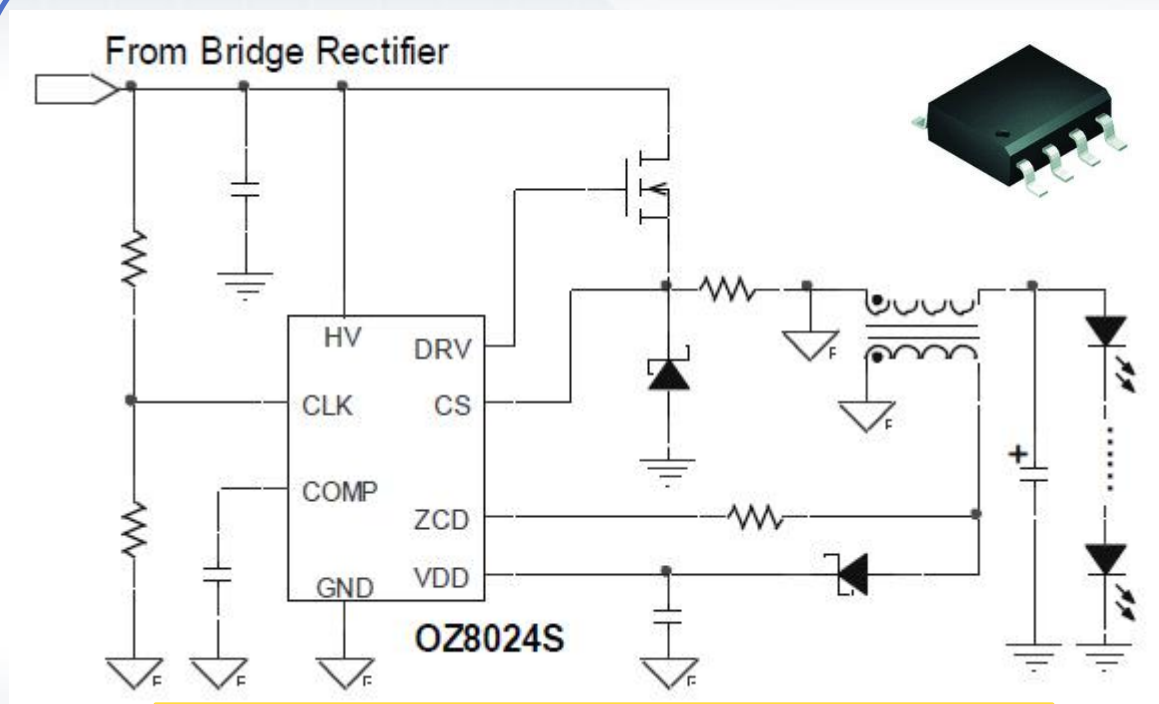
1. US 8,339,063
2. US 8,664,895
3. US 8,890,440
4. US 8,698,419
5. China 201010119888.2
6. China CN 102523661 B
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8. Taiwan I381625
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Free dimming products – continues dimming

特点:

- 现有开关即可实现调光，最低成本的调光方式
- 多灯并联一致性好
- 内置高压启动，全电压范围内启动时间<500ms
- 专利保护
- 支持宽范围输入电压
- $\pm 5\%$ LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护功能
- 封装：S0-8



✓ 支持buck和buck-boost拓扑，其中buck-boost拓扑谐波可以过IEC61000-3-2标准

Free dimming products – 2 level dimming

2-Level Dimming

通过墙壁开关(开/关)
选择全亮和小夜灯



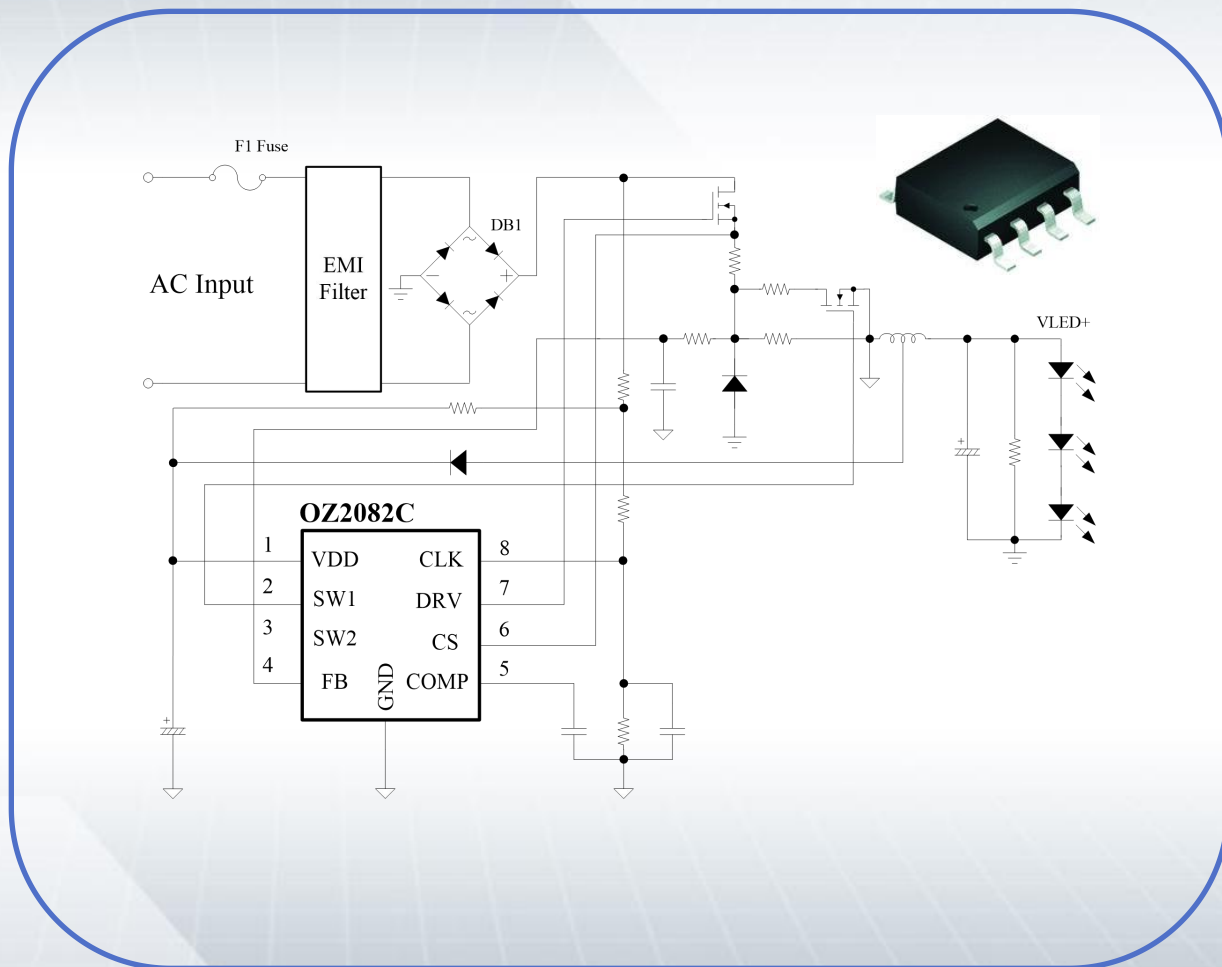
Free dimming products – 2 level dimming

Part No.	OZ2082	OZ2082C
Topology	Buck/Buck-Boost	Buck
High PF	Yes	Yes
2-level dimmer	100%-1mA	100%-adjustable
Isolated	No	No
Operating frequency	Constant Frequency (55khz)	Constant frequency (67khz)
Inductor or XFM current	DCM	DCM
Power MOSFET	External	External
Protection	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP
Package	SOP-8	SOP-8
MP	2013 Q2	2013 Q2

Free dimming products – 2 level dimming

特点:

- 现有开关即可实现调光, 最低成本的调光方式
- 多灯并联一致性好
- 支持宽范围输入电压
- 专利保护
- $\pm 5\%$ LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护功能
- 封装: S0-8



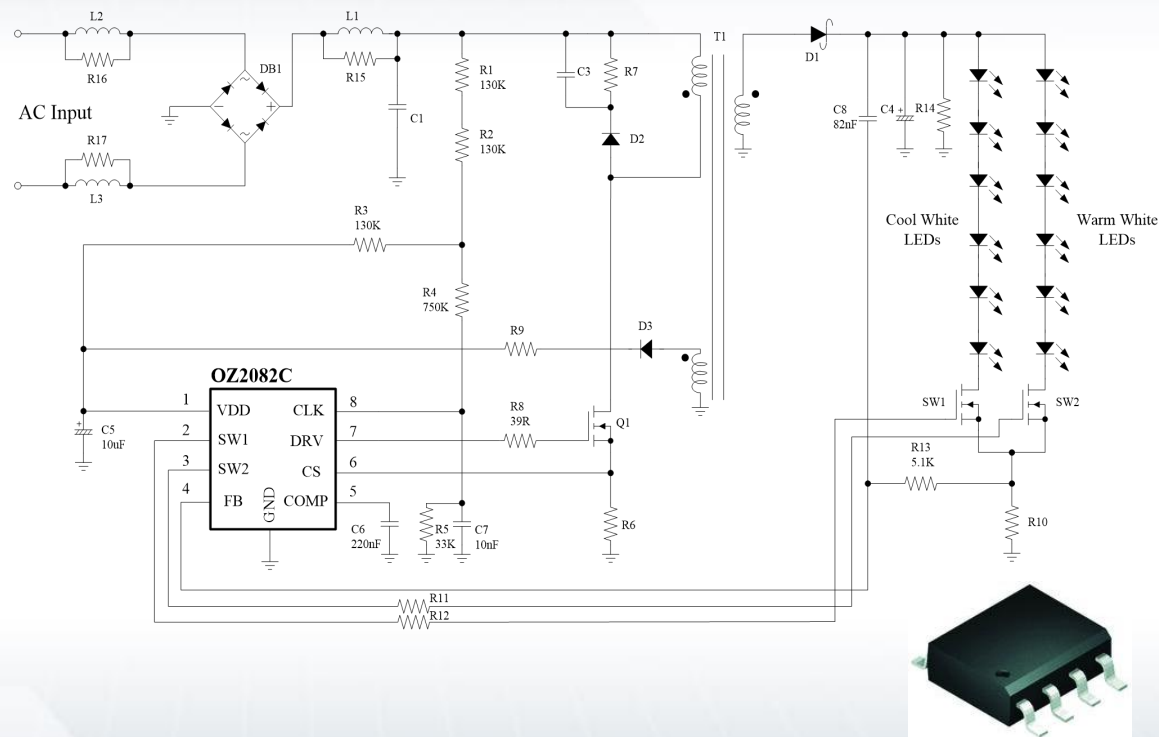
Free dimming products – color dimming

Part No.	OZ2082C	OZ2089	OZ2093
Topology	flyback	flyback	flyback
High PF	Yes	Yes	Yes
color dimmer	White-Warm	White-Warm 0-10V/PWM to analog dimming	White-Mix-Warm
Isolated	No	No	No
Operating frequency	Constant frequency	Constant frequency	Constant frequency
Inductor or XFM current	DCM	DCM	DCM
Power MOSFET	External	External	External
Protection	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP
Package	SOP-8	SOP-16	SOP-8
MP	2013 Q2	2014 Q4	2015 Q4

Free dimming products – color dimming

特点:

- 现有开关即可实现调色温，最低成本的调色方式
- 多灯并联一致性好
- 支持宽范围输入电压
- 专利保护
- $\pm 5\%$ LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护功能
- 封装：S0-8



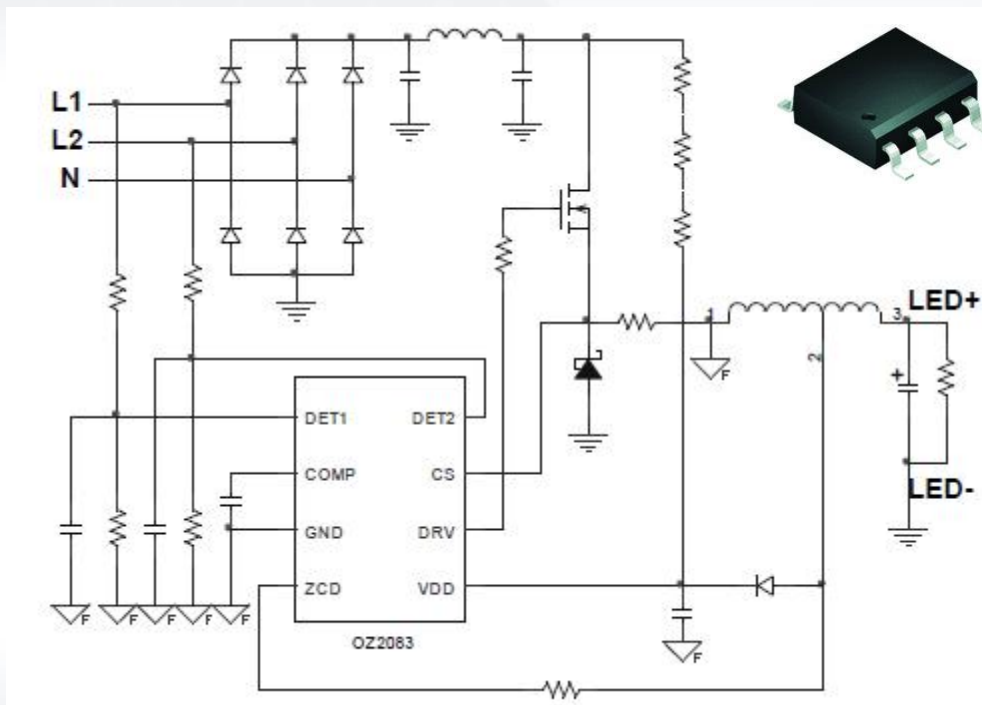
Free dimming products – 3 way dimming

Part No.	OZ2083	OZ2083A
Topology	Buck	Buck
High PF	Yes	Yes
3-level dimmer	32%-64%-100%	100%-50%-25%
Isolated	No	No
Operating frequency	Variable frequency	Variable frequency
Inductor or XFM current	CRM & DCM	CRM & DCM
Power MOSFET	External	External
Protection	OTP,OVP, OCP, SCP	OTP,OVP, OCP, SCP
Package	SOP-8	SOP-8
MP	2013 Q2	2013 Q2

Free dimming products – 3 way dimming

特点:

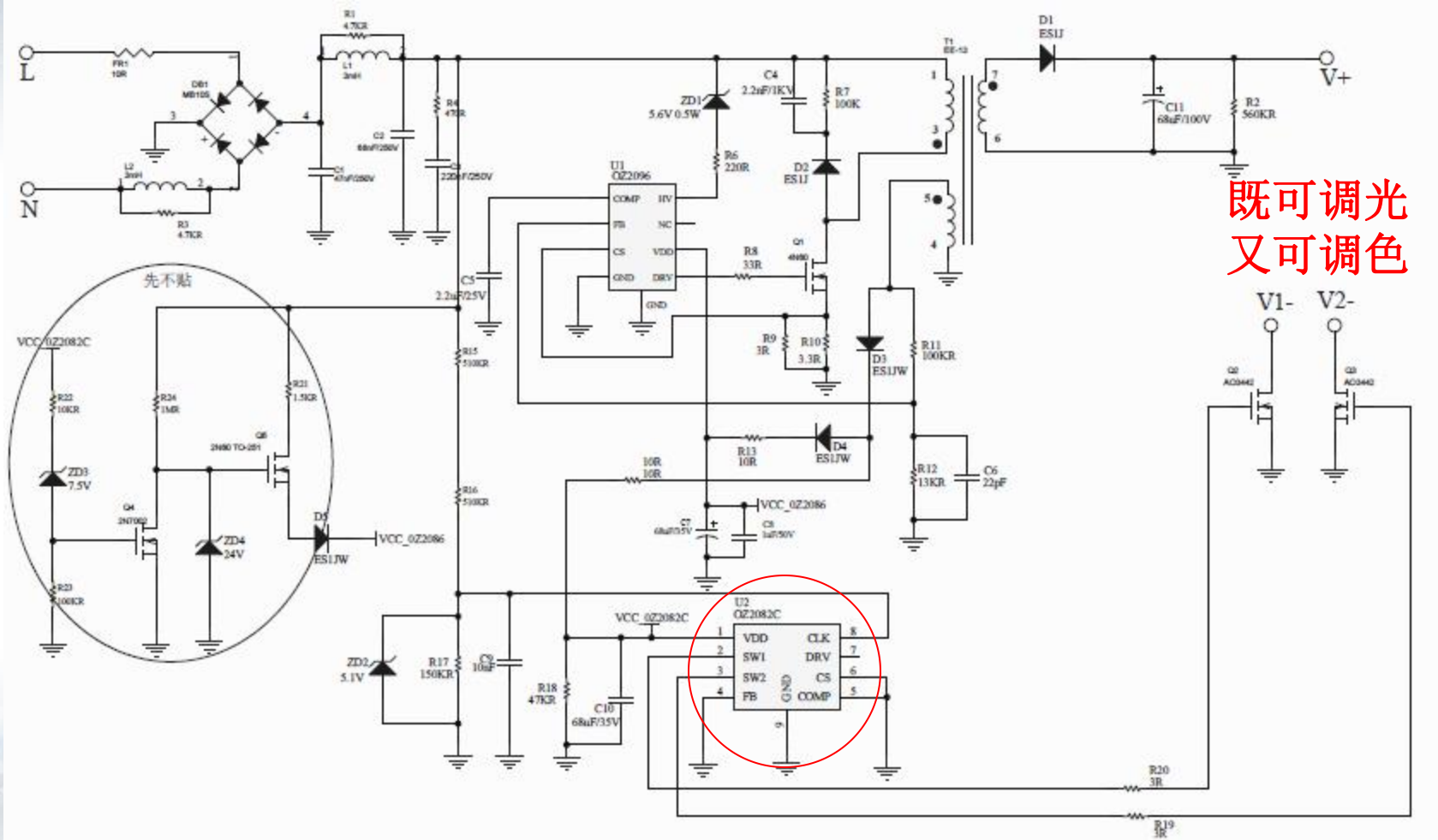
- 应用于北美特有的三位开关
- 每段调光之间不灭
- 专利保护 US 9 402 286 B2
- $\pm 5\%$ LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护功能
- 封装: S0-8



Typical Application

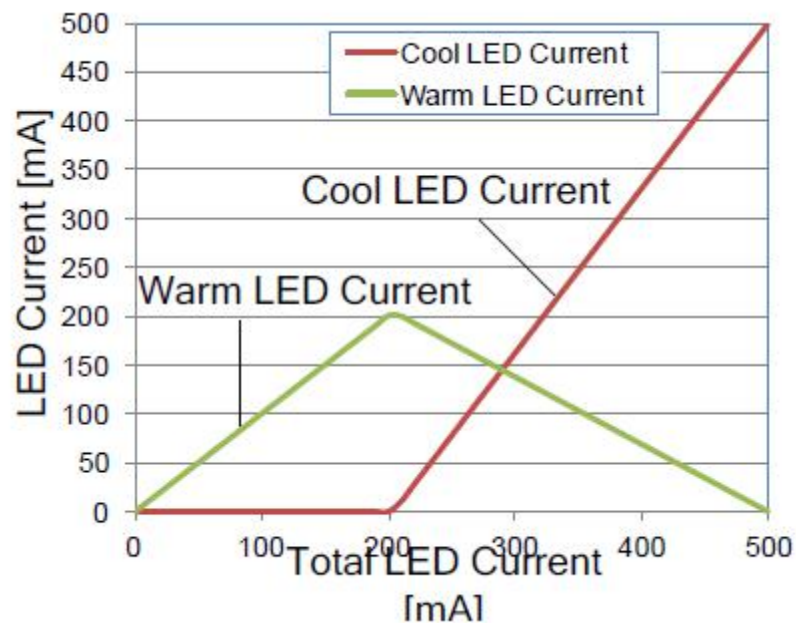
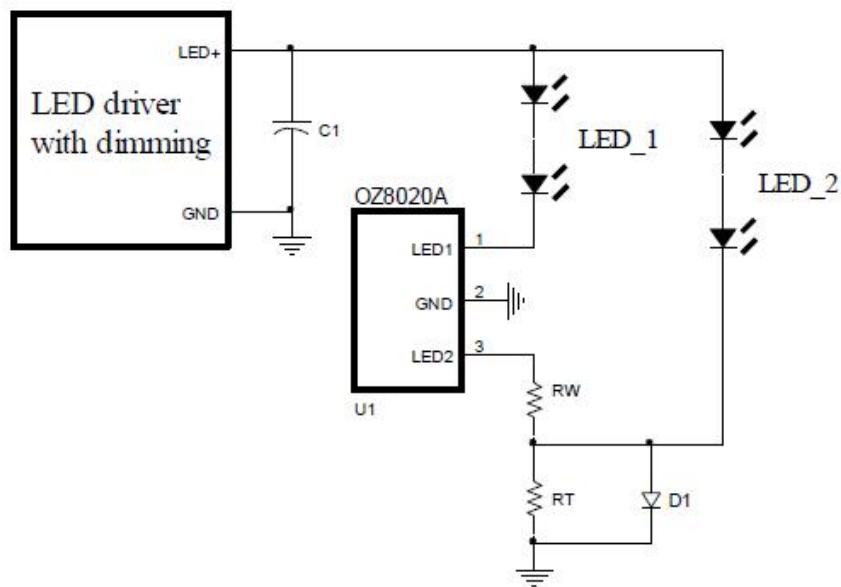


Triac dimming with color switch

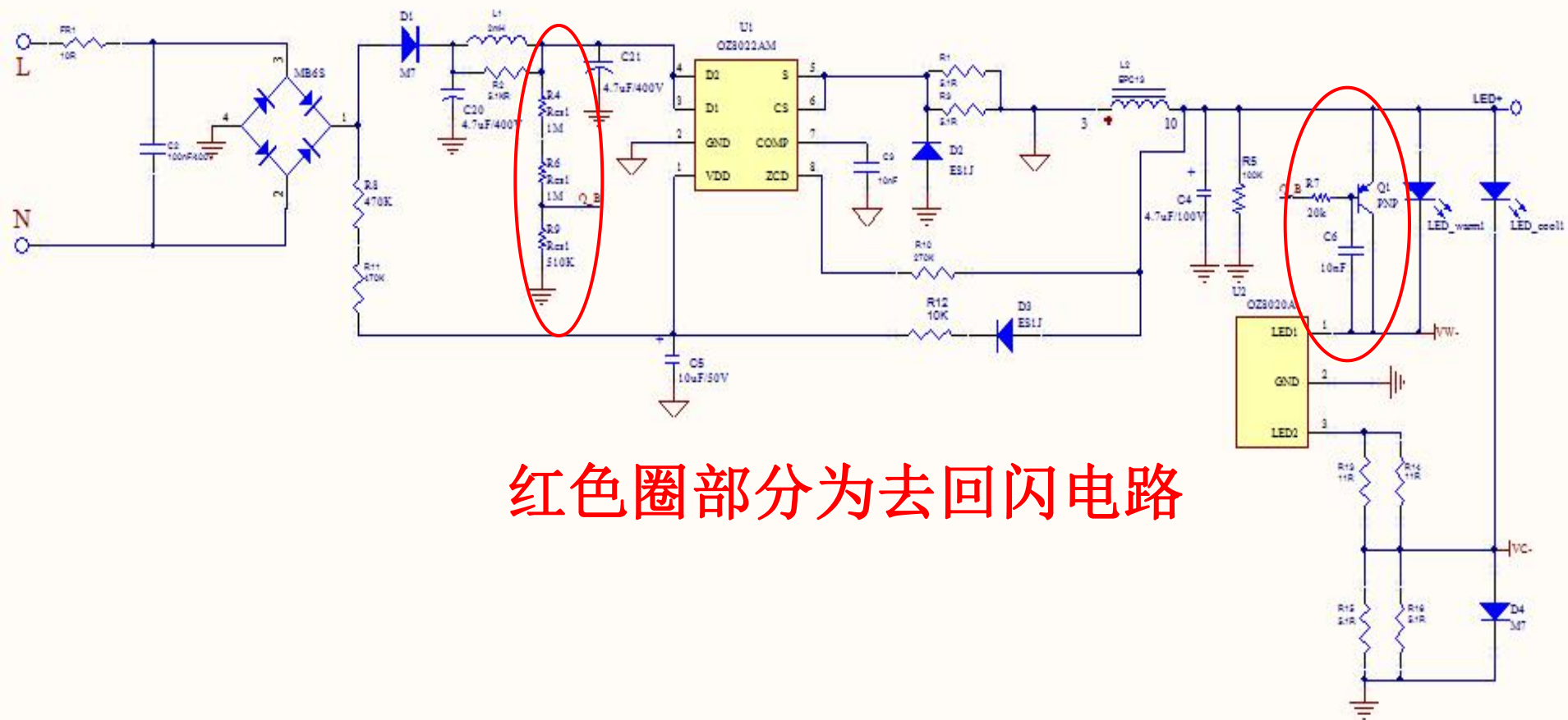


Triac dimming with sunset

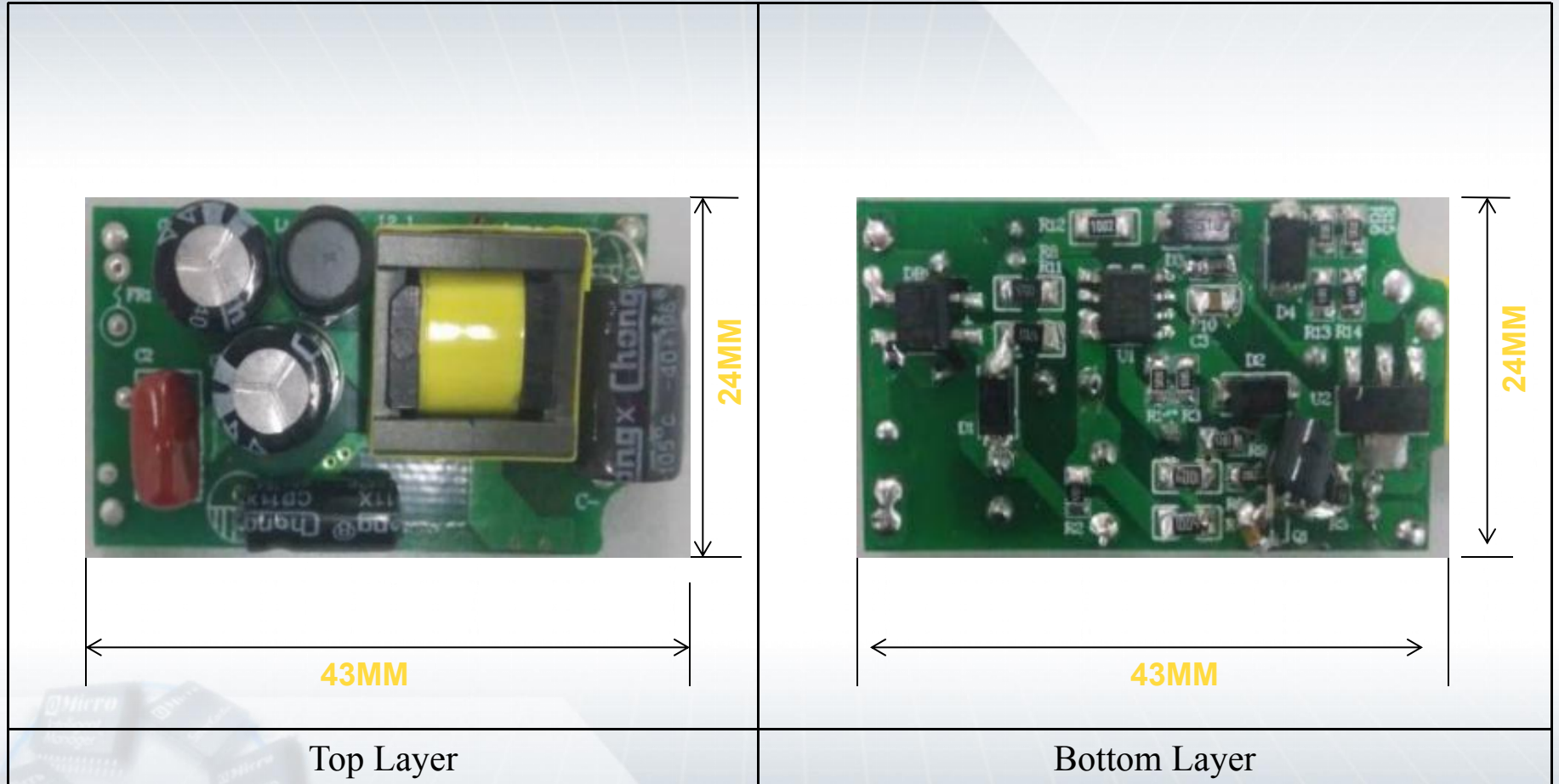
模拟落日的灯光变换



Three level dimming with sunset



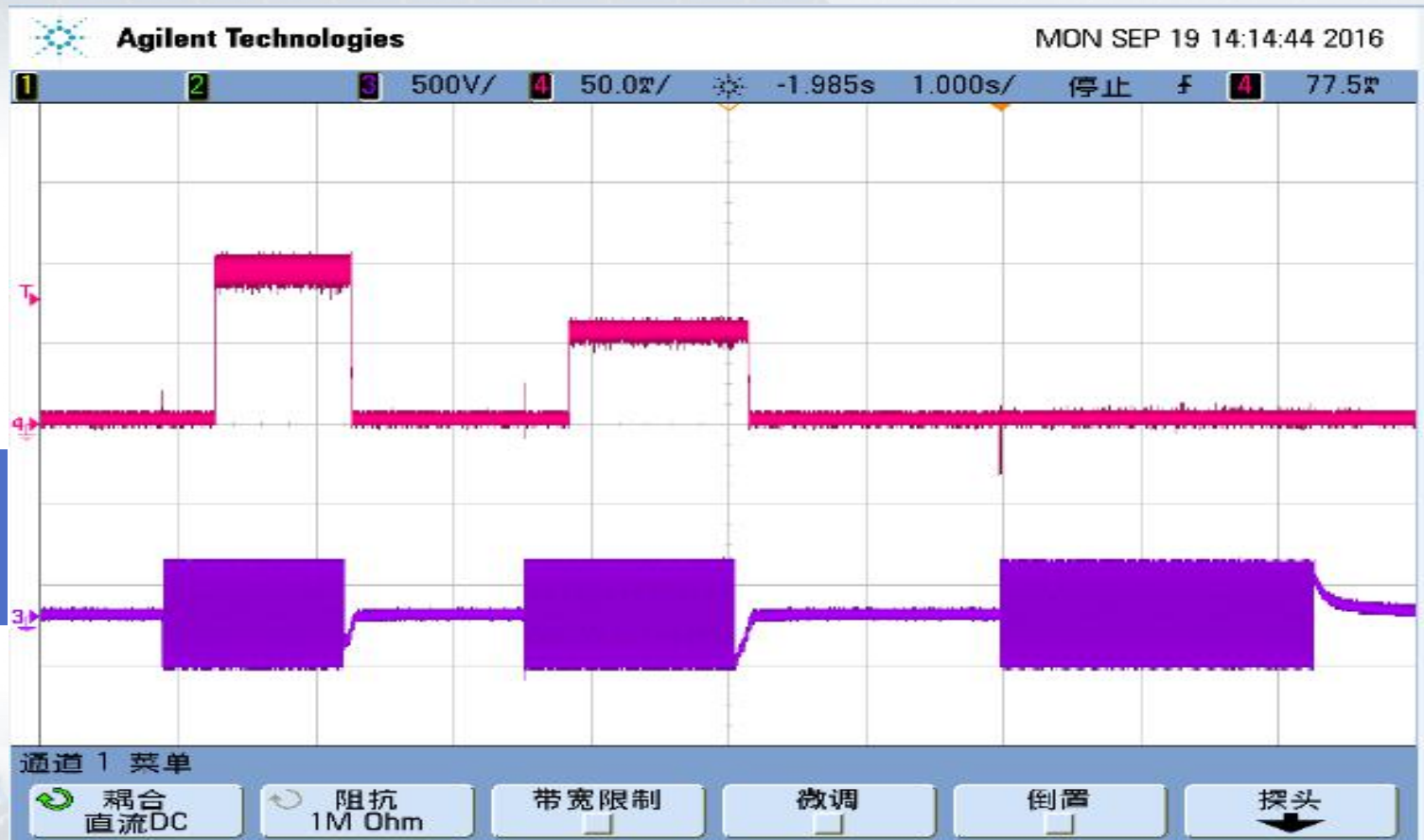
PCB



PCB SIZE: 43MM*24MM

Dimming current waveform

cool-color current



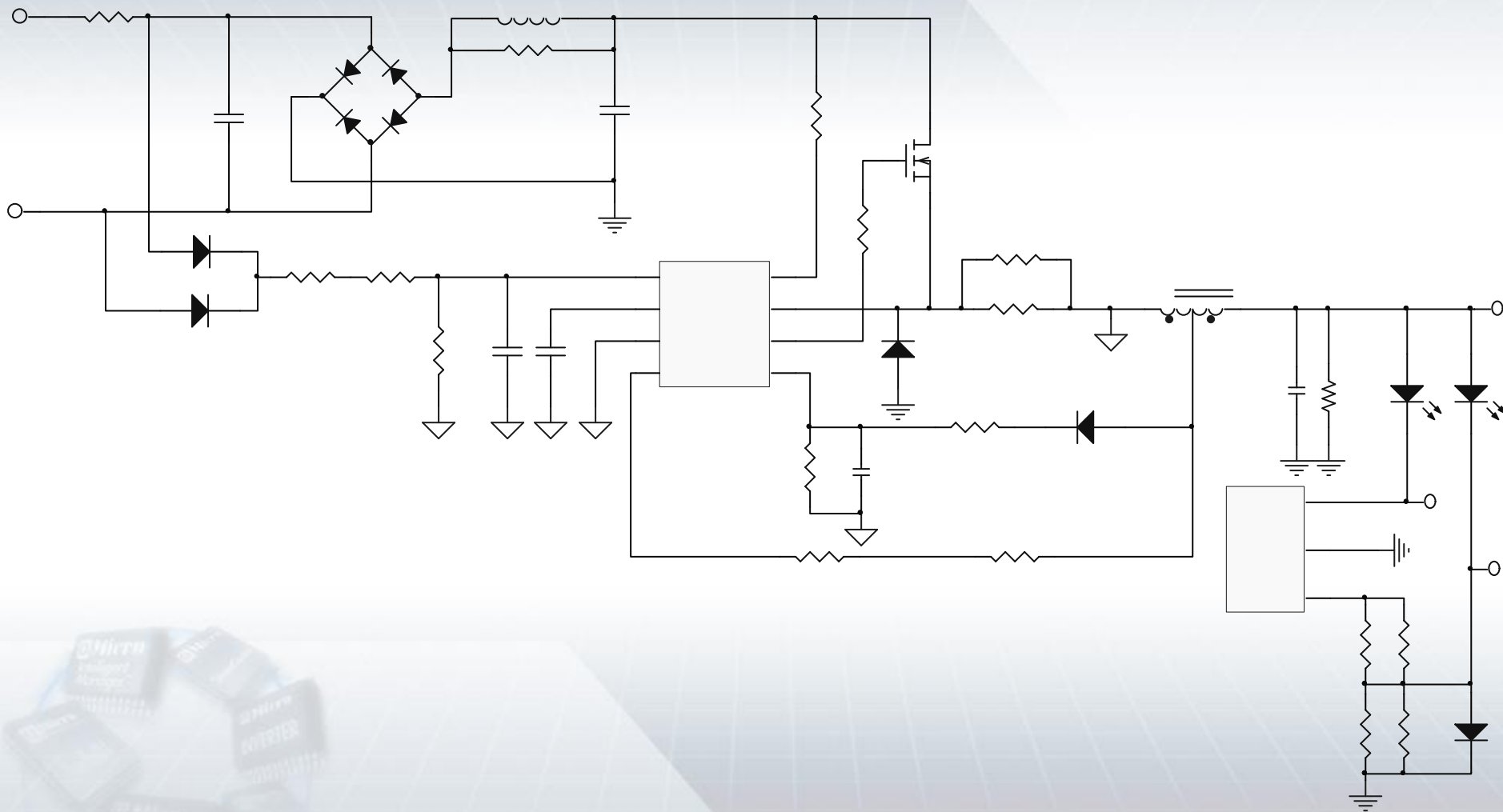
the cool-color current is zero when the 3-level dimming

warm-color current

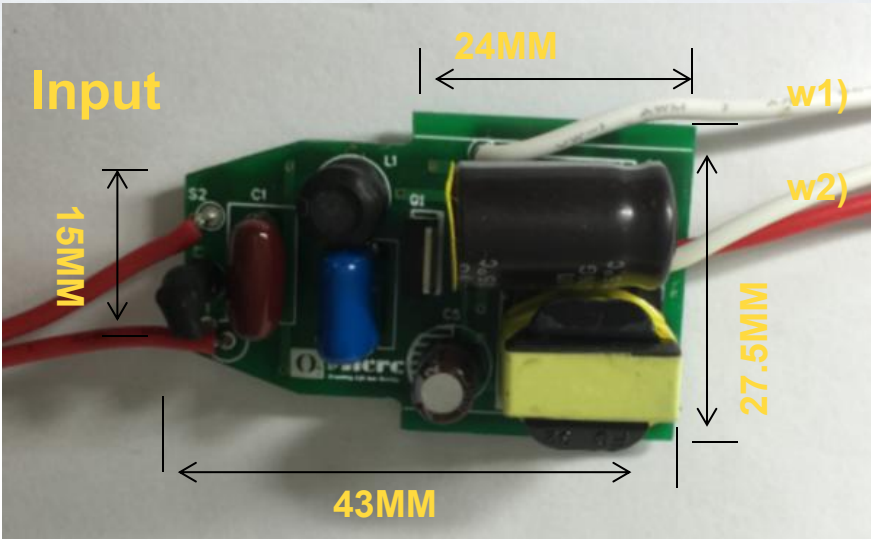
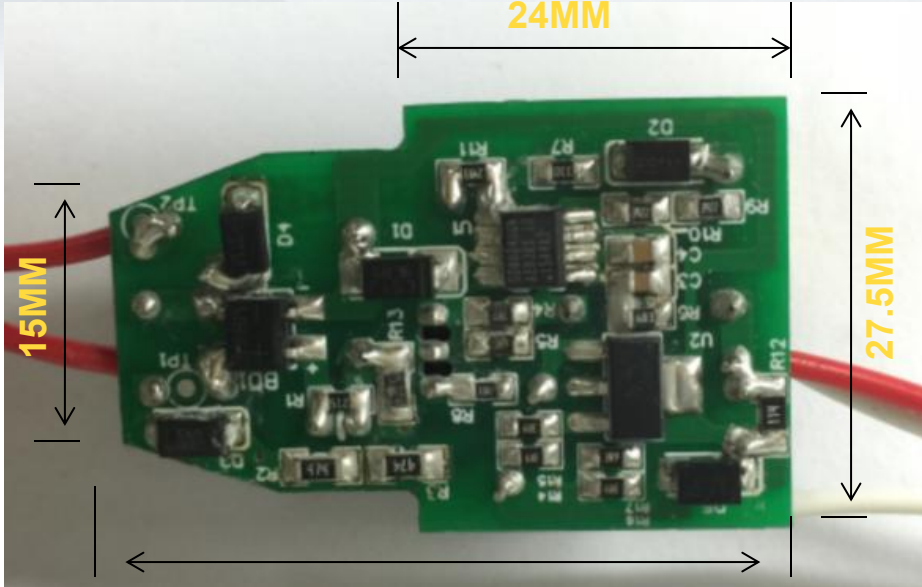


When 1-Level, 2-Level dimming, the warm-color current is almost zero

Continue dimming with sunset



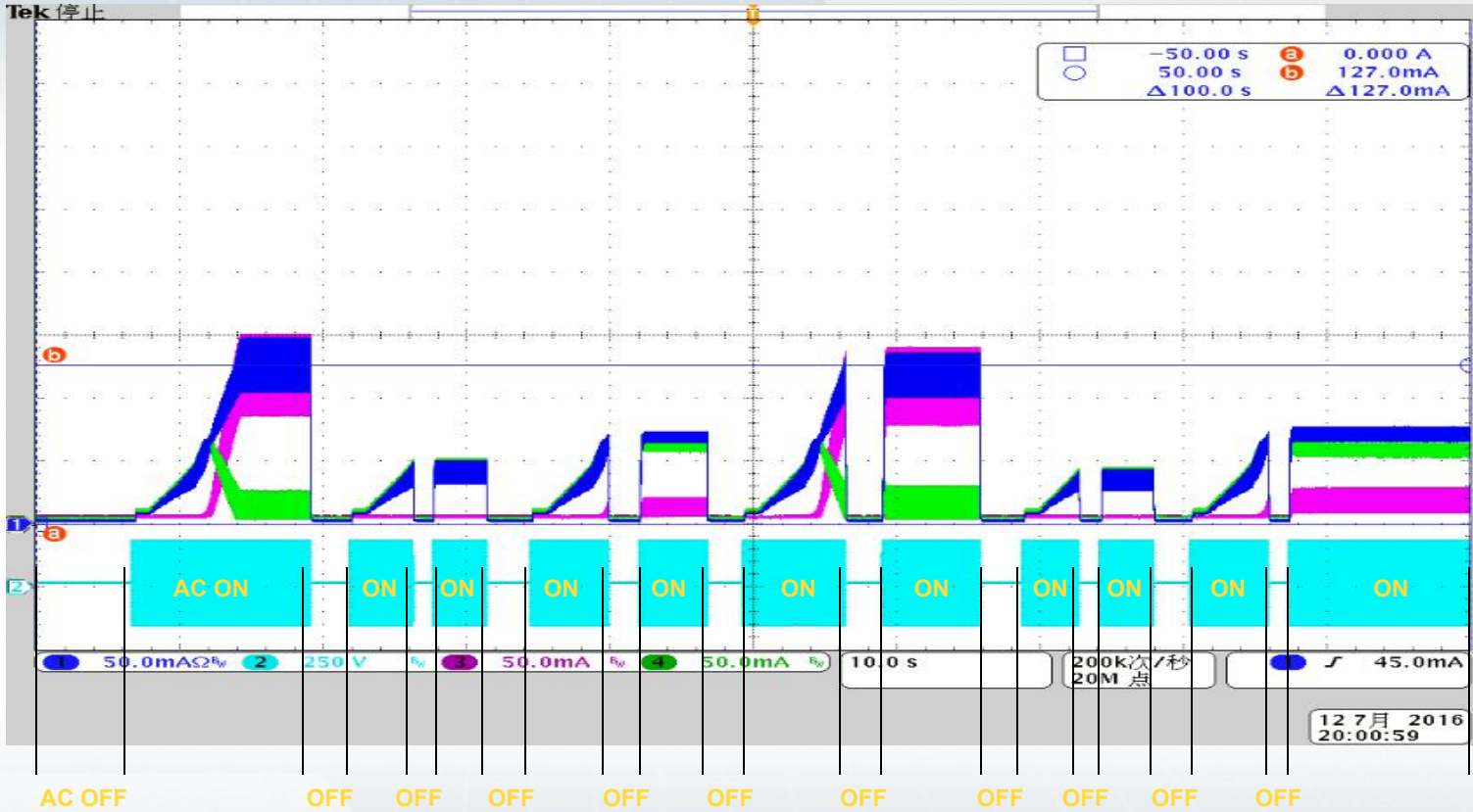
PCB

 Input 24MM 15MM 27.5MM 43MM Output w1) w2) OUTPUT Red wire: LED+ White wire w1: cold LED- White wire w2: warm LED-	 24MM 15MM 27.5MM 43MM
Top Layer	Bottom Layer

PCB SIZE: 43MM*27.5MM*16MM

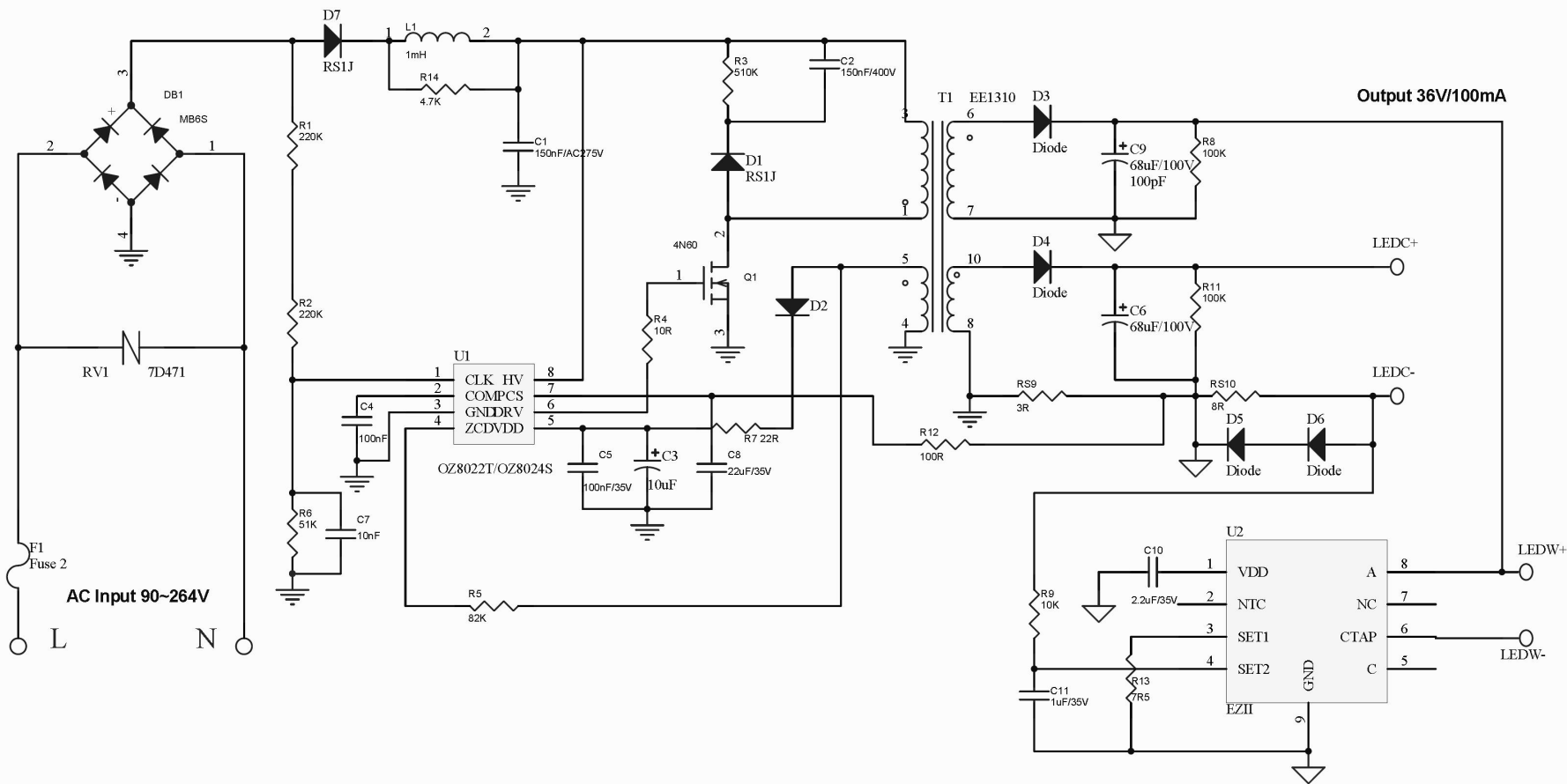
Continuous dimming waveform @ 220Vac

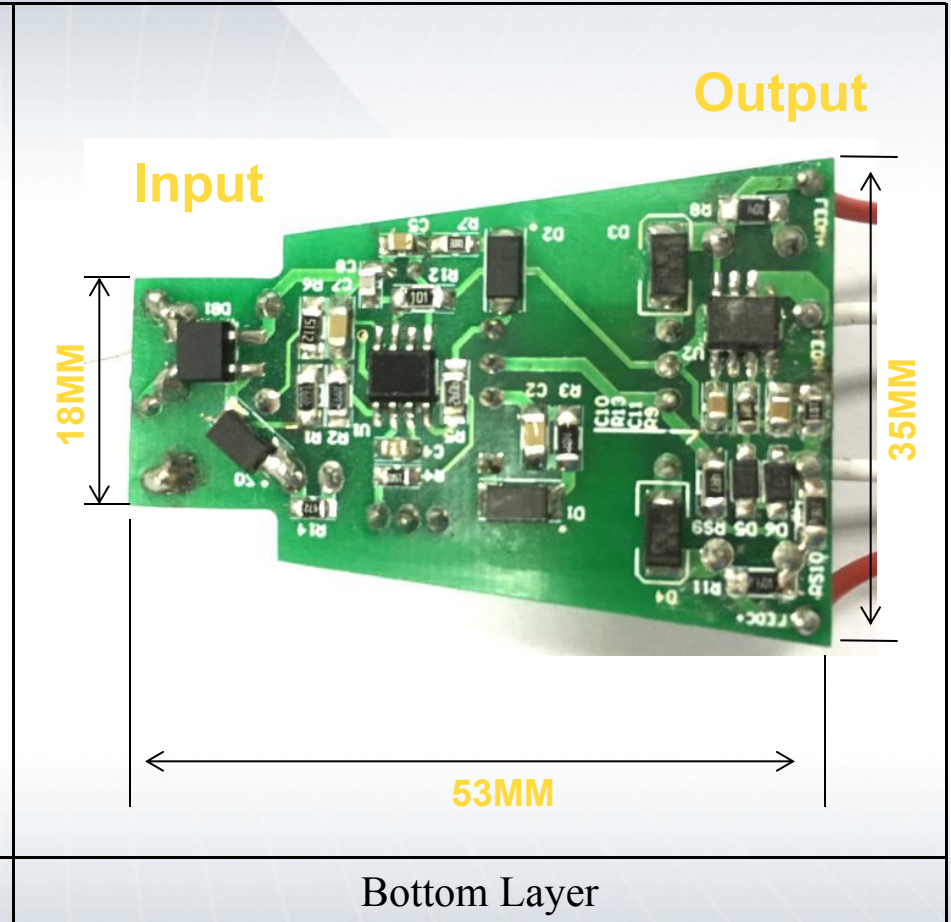
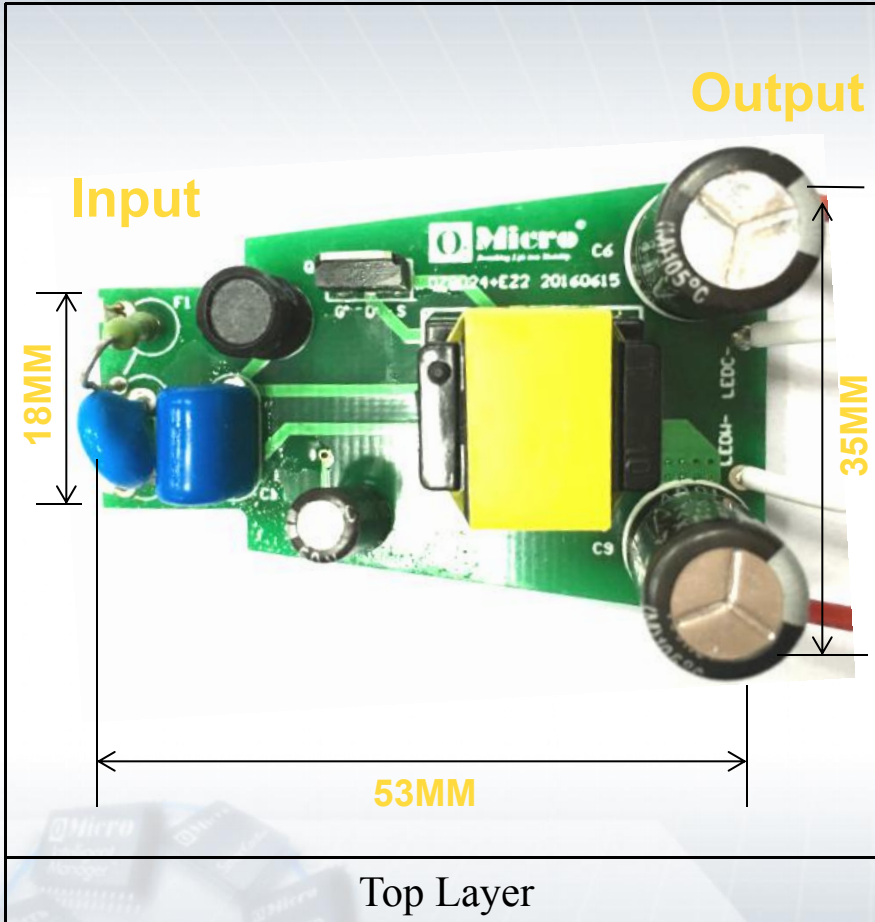
CH1: I_{LED} total
CH2: V_{AC}
CH3: I_{LED} cold
CH4: I_{LED} warm



V_{in} , [Vac]	220	
I_{LED} , [mA]	6	130
VCC, [V]	15.42	18.28

Color-Mixed 恒功率变色温



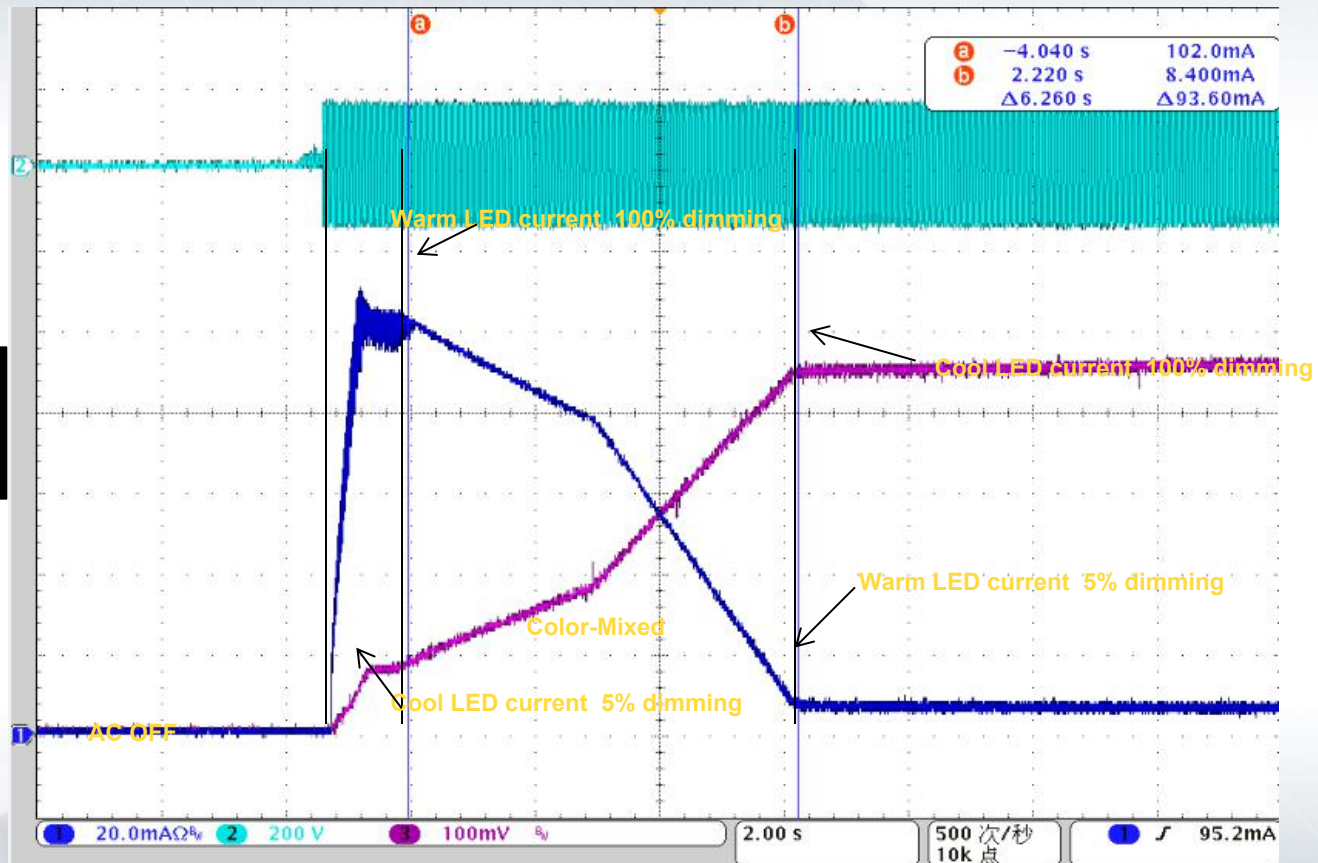


PCB SIZE: 53MM*35MM

Color-Mixed

color-mixed dimming waveform

CH1: I_{WarmLED}
CH2: V_{AC}
CH3: V_{SET2}



0-10V dimming Products



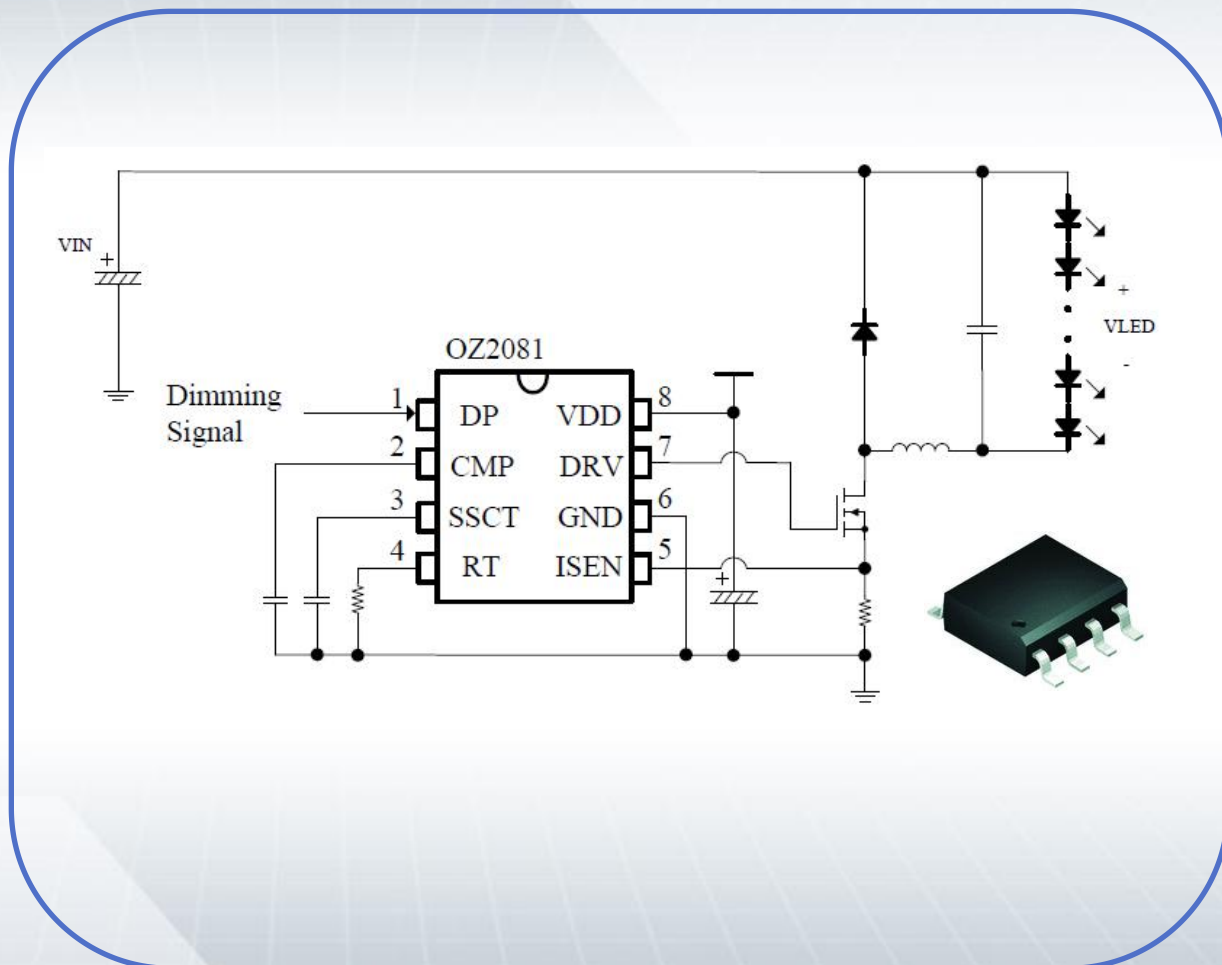
0-10V dimming

Part No.	OZ562...6	OZ9906	OZ2081
Topology	BUCK	BUCK	Buck
dimming	PWM dimming, analog(100%-10%)	PWM dimming, Analog -> PWM dimming	Analog dimming PWM->Analog dimming(100%-5%)
LED string	2	6	1
Power MOSFET	External	External	External
Package	SOP-16, DIP-16	SOP-28	SOP-8
MP	2013 Q2	2013 Q2	2015 Q2

0-10V dimming

特点:

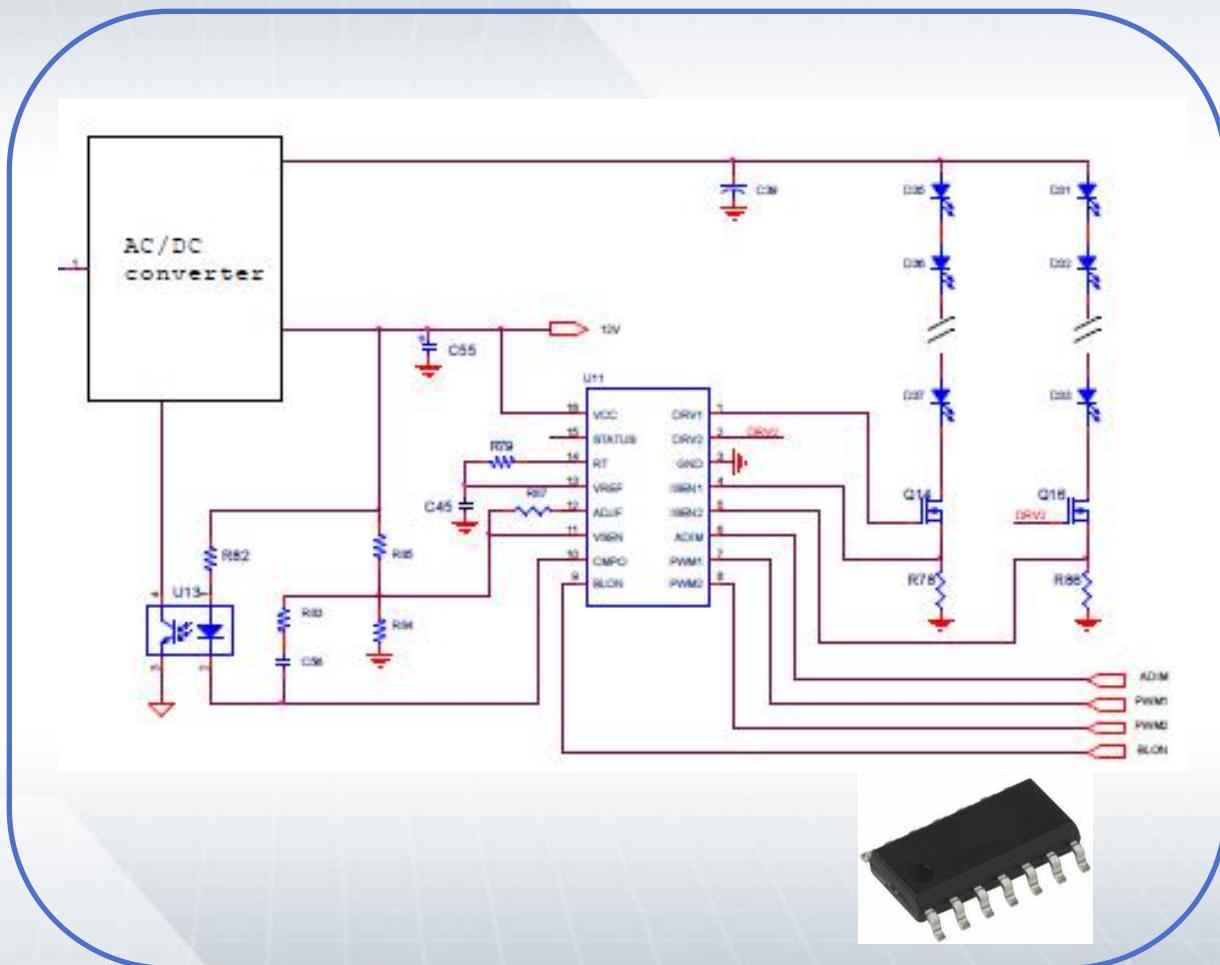
- 5%-100%调光范围
- 兼容模拟调光和PWM调光
- 模拟输出，无纹波
- LED 开路保护
- LED电流短路保护
- 过温保护
- 封装：SOP-8



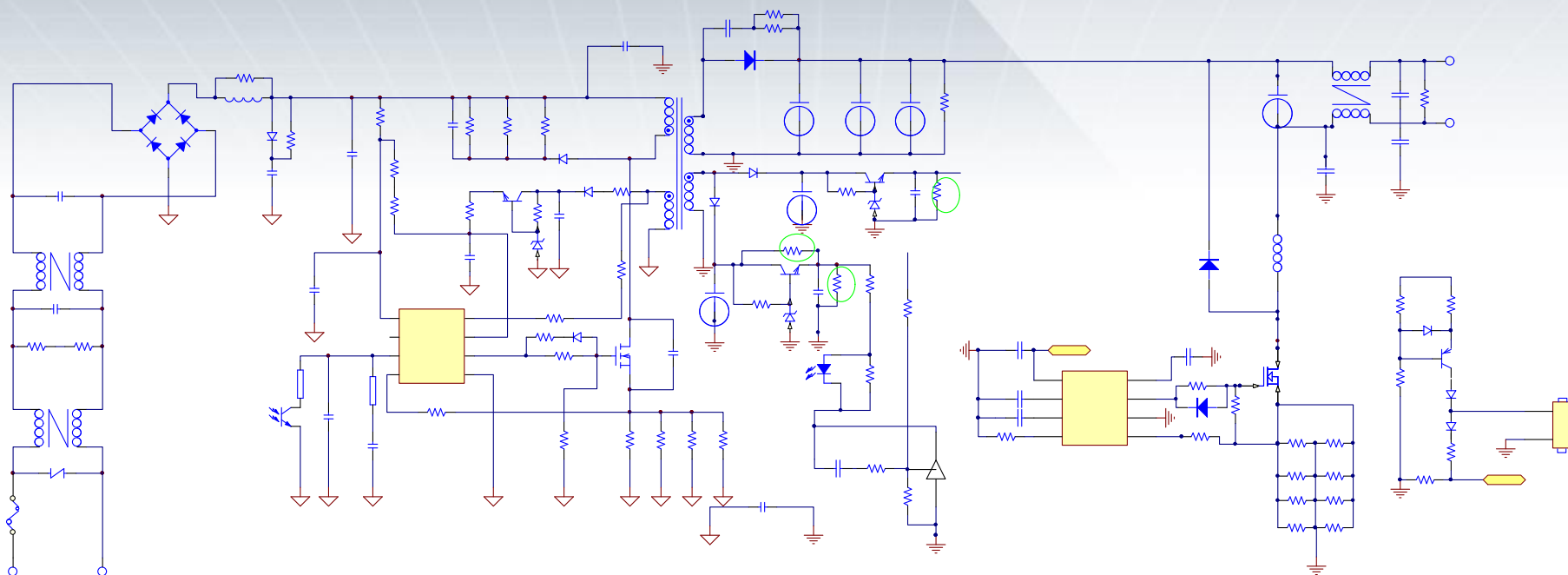
0-10V dimming

特点:

- 模拟调光5%-100%范围
- PWM调光0%-100%范围
- 双通道输出，可以调光调色
- 支持宽范围输出电压
- LED 开路保护
- LED电流短路保护
- 过温保护
- 封装：SOP-16



0-10V dimming



特点: (OZ8023 + OZ2081)

- 调光深度1%-100%范围
- 高功率因素，无频闪
- 输出88% 效率

Non dimming Products



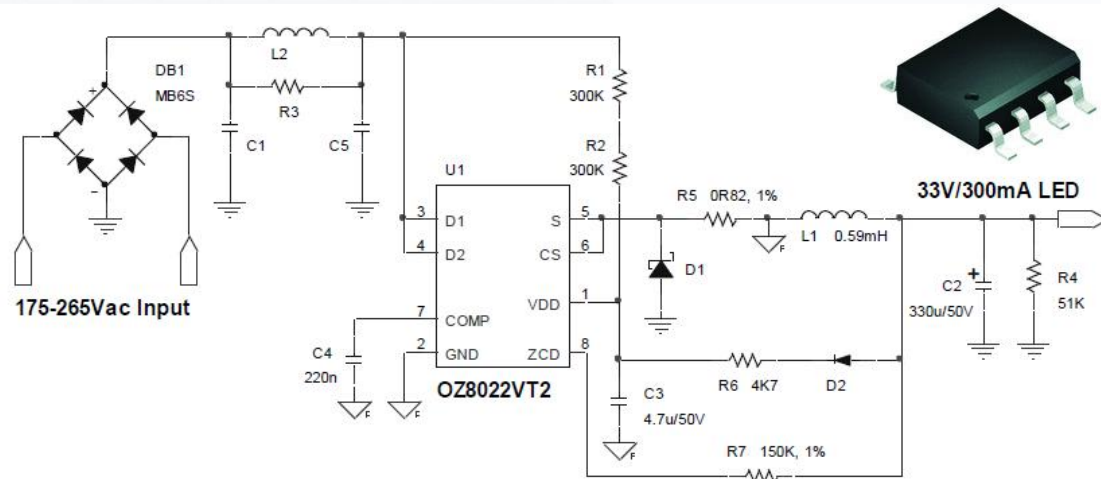
High PF Non-isolation

Part No.	OZ8022V	OZ8022VT	OZ8022VT2	OZ8022VTC
Topology	Buck/Buck-Boost	Buck/Buck-Boost	Buck/Buck-Boost	Buck/Buck-Boost
High PF	Yes	Yes	Yes	Yes
Power range	<60W	<60W	<10W	<18W
Po (Vin:100-240Vac)	72V/800mA	72V/800mA	72V/130mA	72V/230mA
No-dimming	Yes	Yes	Yes	Yes
Operating frequency	Variable frequency	Variable frequency	Variable frequency	Variable frequency
Inductor or XFM current	CRM & DCM	CRM & DCM	CRM & DCM	CRM & DCM
Power MOSFET	External	external	2A/550V Rdson:6.5Ω	4A/650V Rdson:2Ω
Package	SOT23-6	SOT23-6	SOP-8	SOP-8
过热降电流	No	Yes	Yes	Yes
MP	2010 Q2	2014 Q4	2014 Q4	2016 Q3

High PF Non-isolation

特点:

- 内部集成500V功率管
 - OZL8022VT2
内置MOS: 2A
 - OZL8022VT4
内置MOS: 4A
- 全电压范围之内PF>0.9
- 电感电流临界连续模式
- 宽范围输入电压
- ±5% LED输出电流精度
- 防止断电LED回闪
- LED电流短路保护
- LED电压开路保护
- 过热降电流功能
- 封装: SOP-8

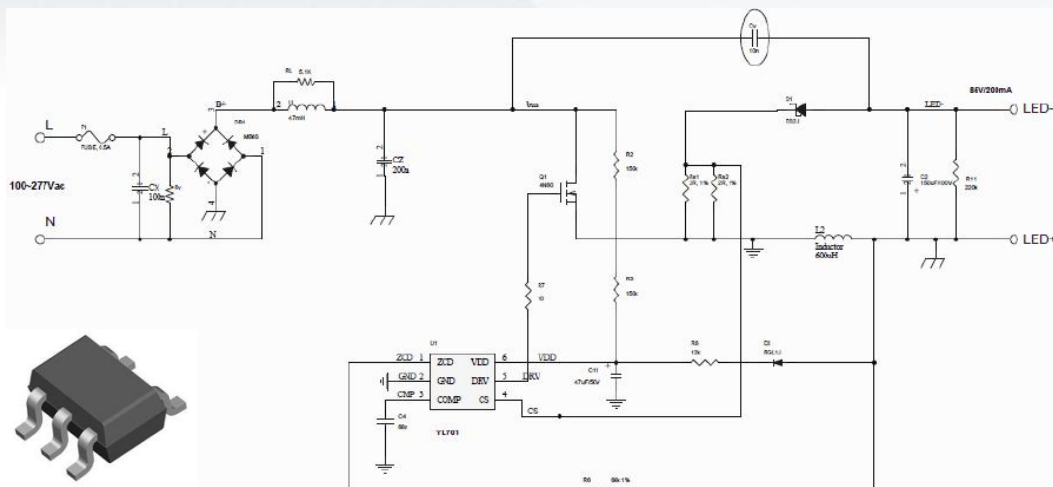


- ✓ 支持buck和buck-boost拓扑, 其中buck-boost拓扑谐波可以过IEC61000-3-2标准
- ✓ 高温降电流, 节约结构件

High PF – low THD

特点:

- 全电压范围之内PF>0.9
- 分次谐波过IEC61000-3-2
- 全电压范围总谐波小于20%
- 宽范围输入电压
- $\pm 5\%$ LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护
- 封装: SOT23-6



✓ 全电压范围之内
分次谐波可以过
IEC61000-3-2标
准，总谐波<20%。

谐波次数 n	基波频率下输入电流的百分数表示的 最大容许谐波电流(%)
2	2
3	30@1
5	10
7	7
9	5
$11 \leq n \leq 39$	3

High PF isolated

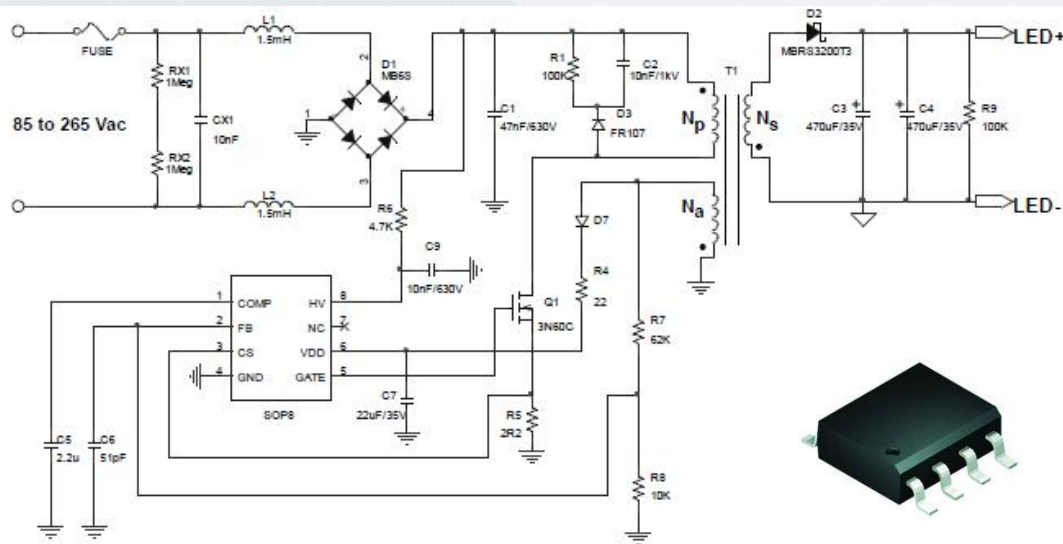
Part No.	OZ8027V
Topology	PSR Flyback
High PF	Yes
Operating frequency	Constant frequency (67kHz)
No dimming	Yes
Photo-coupler/TL431	No
XFM current	DCM
Power switch	External
Features	HV start
Protection	OTP,OVP, OCP, SCP
MP	2012 Q2



High PF isolated

特点:

- 全电压范围之内PF>0.9
- 分次谐波过IEC61000-3-2
- 全电压范围总谐波小于10%
- 电感电流断续模式
- 宽范围输入电压
- ±5% LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护
- 封装: SOP-8



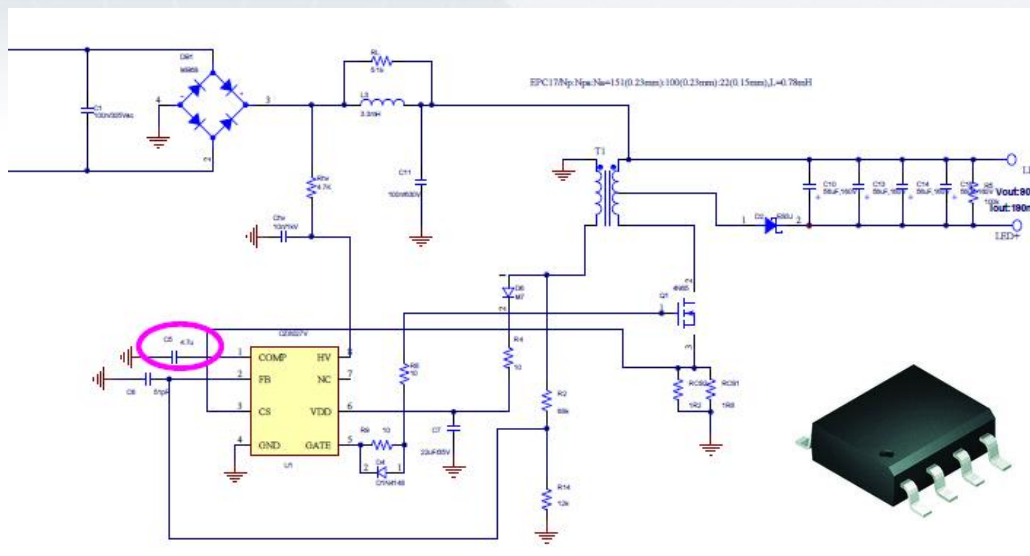
✓ 全电压范围之内
分次谐波可以过
IEC61000-3-2标
准, 总谐波<10%。

谐波次数 n	基波频率下输入电流的百分数表示的 最大容许谐波电流(%)
2	2
3	30@1
5	10
7	7
9	5
11 ≤ n ≤ 39	3

High PF – Low THD

特点:

- 全电压范围之内PF>0.9
- 分次谐波过IEC61000-3-2
- 全电压范围总谐波小于10%
- 电感电流断续模式
- 宽范围输入电压
- ±5% LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护
- 封装: SOP-8



✓ 全电压范围之内
分次谐波可以过
IEC61000-3-2标
准，总谐波<10%。

谐波次数 n	基波频率下输入电流的百分数表示的 最大容许谐波电流(%)
2	2
3	30@1
5	10
7	7
9	5
$11 \leq n \leq 39$	3

Low PF Non-isolation

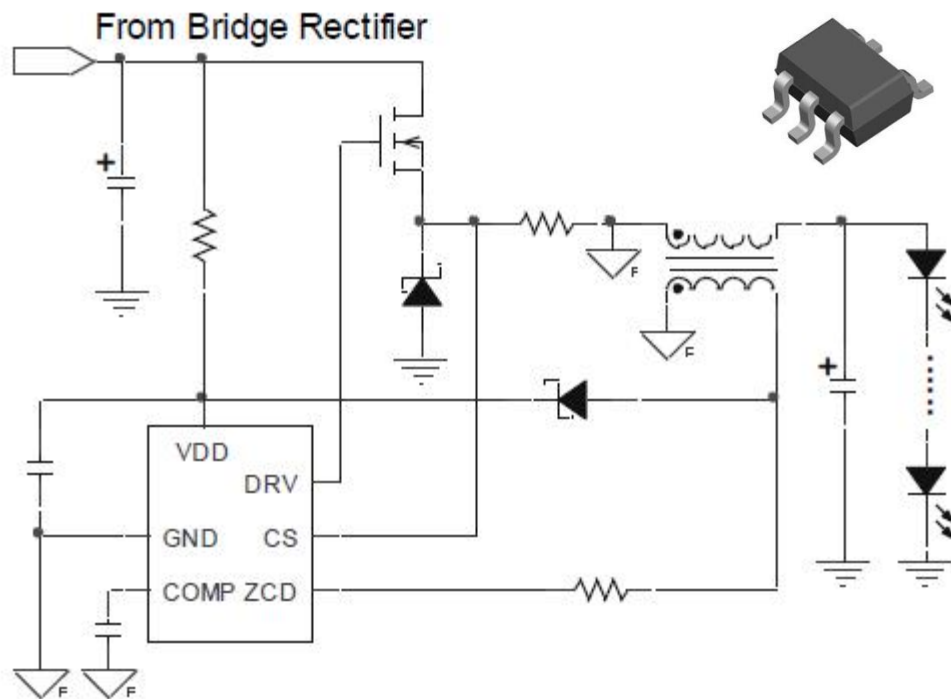
Part No.	OZ8022
Topology	Buck
High PF	-
Power range	<60W
No-dimming	Yes
Operating frequency	Variable frequency
Inductor or XFM current	CRM & DCM
Power MOSFET	External
Package	SOT23-6
过热降电流	No
MP	2010 Q2



High PF Non-isolation

特点:

- 低PF外置MOS
- 电感电流临界连续模式
- 宽范围输入电压
- $\pm 5\%$ LED输出电流精度
- LED电流短路保护
- LED电压开路保护
- 过温保护
- 封装: SOT23-6



MR16



Spec	Description
Input	12V from ET
Power	<10W
PF	0.5 or >0.7
EMC	Pass



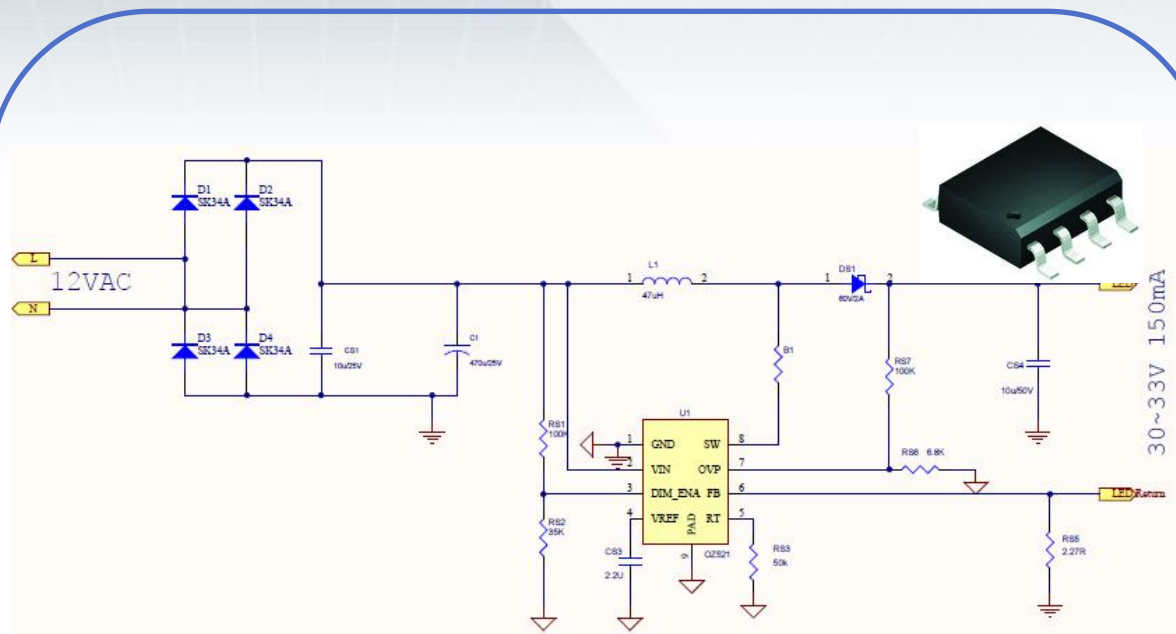
MR16

Part No.	OZ521	OZ2091
Topology	BOOST	Boost+linear
High PF	-	Yes
compatibility	Better	Best
dimming	Compatible with lagging edge triac dimmers	No
Power MOSFET	Internal(50V 4A)	External
Package	ESOP-8	SO-8
MP	2012 Q2	2014 Q1

MR16 – OZ521

特点:

- 电子变压器兼容性好
- 低PF
- 支持北美后延可控硅调光
- 内置50V4A MOSFET, 最大可做10W
- $\pm 5\%$ LED输出电流精度
- 防止断电LED回闪
- 封装: ES0-8

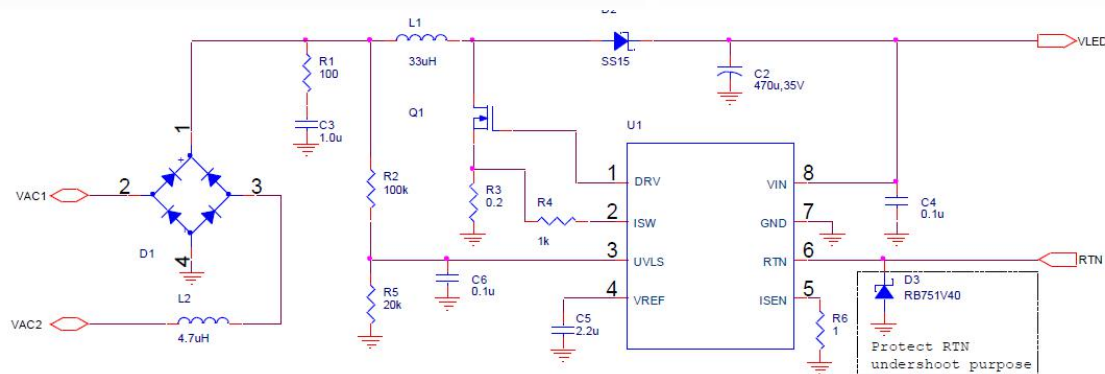


- ✓ 外围元器件少, 体积小
- ✓ ESOP-8封装, 散热好

MR16 – OZ2091

特点:

- 完美的电子变压器兼容性
- 高PF
- 输出电流无纹波
- $\pm 5\%$ LED输出电流精度
- 防止断电LED回闪
- 封装: S0-8



- ✓ 外围元器件少，体积小
- ✓ 兼容性媲美竞争对手两级方案，但BOM低很多



MR16 – OZ2091

◆ Electrical transformer compatible

List	Brand	ET type
1	LIT	LTR-60
2	SELV	TBJ
3	EVN	SPIDER 60S
4	OSRAM	EN61347
5	EVN	EVN70V
6	COPPERTEC	TRE 22125-B
7	LIGHTTECH	LED 25CV 12V EMD
8	EMC	YT105
9	EVN	PUCK105
10	PHILIPS	ET-E 60
11	OSRAM	MTH 105
12	OSRAM	MTH 70
13	ROBUS	LEB60D
14	西顿	CS60
15	FSL	EA-HF50
16	TCI	SHARK60
17	OSRAM	EN55015
18	NOBILE	EN-60D
19	LD	ET105A
20	NOBILE	EN-60D
21	EVN	MINI JOKB 105
22	EVN	PUCK 70-20-70W
23	OPEX	LC60-20-60VA
24	SELV	ET60
25	FORCE	
26	TRIDONIC	VIPER
27	ET	SET60LT
28	SELV	ET105
29	YAM	YMET-105B
30	EVN	EVN110V

List	Brand	ET type
31	LTGHT	ET60
32	STAR	TX-ST60
33	CROMBTON	CBC60FP
34	HALCVON	TRA70W
35	EVD	SPIDER105D
36	NOBILE	EN-150D2
37	NOBILE	EN-80D
38	ROBUS	LEB60P
39	EVN	PD.2/105
40	EVN	CLOU 60
41	BP	ORLET
42	LD	ET60A
43	上海亚明	ET60E
44	PHILIPS	CERTALINE
45	REFINE OPTO	RF6002-CV12
46	AURORA	AU-E60
47	RELCO	RN1622
48	BAW	TREH60C1
49	TCI	PICO WOLF 105
50	ACTEC	MINI105
51	PHILIPS	IEC61347-2-2
52	NOBILE	EN-110D
53	YT50	EN61347
54	VS	186077
55	RELCO	FOX 105 PFS TIF
56	TCI	SHARK105
57	OSRAM	ET-RROT 70/220

List	Brand	ET type
4	ACTEC	MINI105
5	ACTEC	VENUS60
6	BRILLIANT	VIVA99994
7	CROMPTON	EXEL60VA/H
8	CLA	CLADRAGON
9	CHIA CHIEN	ETC-060S
10	CLIPSAL	CDL1E60C
11	EVOT	ET1260
12	EXPO	CRT60
13	EXPO	CRC60
14	FOCUS	FOC60
15	genteck	SHARKIE E105
18	genteck	E61 NIPPY
19	GALAXY	GALTRF_REXFP
20	ILD	ILD-ET60
21	ITALUX	PICCOLO
22	LOO	LC0060VA
23	LAMPTECK	LT-60
24	LIGHTSTAR	LS60
25	LUXMAN	ETH60.202
26	LITE STAR	LS-ET60
27	LUXALITE	GD32LH
28	LUCCI	TB60L
29	LITE STAR	LTR-60
30	NELSON	mtcougar60
31	OSRAM	HALOTRONIC HTM70
32	OSRAM	HALOTRONIC HTM105
33	OSRAM	HALOTRONIC HTM150
34	OSRAM	ET REDBACK
35	OZ-DEM	
36	POSSUM	V99
37	PIERLITE	TB60L
38	Radium	ET-RALOPOWER
39	SUPERNOVA	SN60HW
40	SPEEDY	TE0105 C101
41	SPEEDY	TE-0070 C101

Thank you!

