20W升压LED驱动应用参考

1. 应用信息

1.1 芯片介绍

本驱动方案是使用VSA1350做的一款升压电路，VAS1350是一款工作于 PFM 模式的升压转换芯片,VAS1350具有如下特点：

①、采用外置 NMOS，高达10V栅压驱动，通过调节外接电流检测电阻可稳定输出高达2A的电流，适用于各种大功率 LED 阵列的应用场合，如景观灯、路灯、广告灯等

②、通过VIN串联电阻可实现 5V-100V的宽电压输入

③、内置各种保护功能：OVP-GND短路保护、输出过压保护、输入欠压保护、过温保护

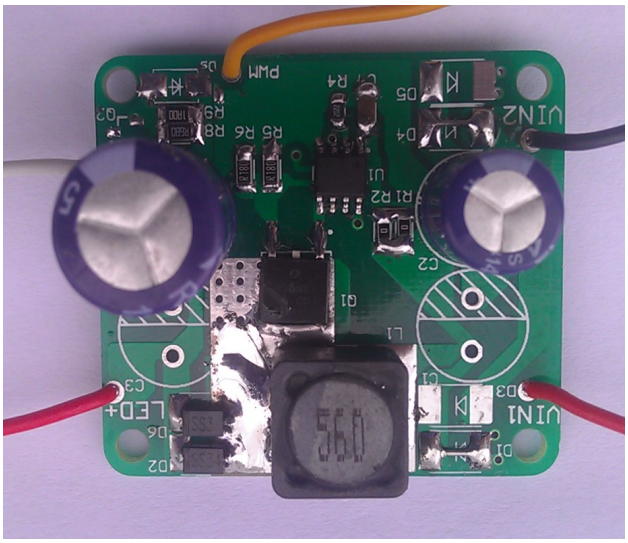
④、直流及PWM调光自适应

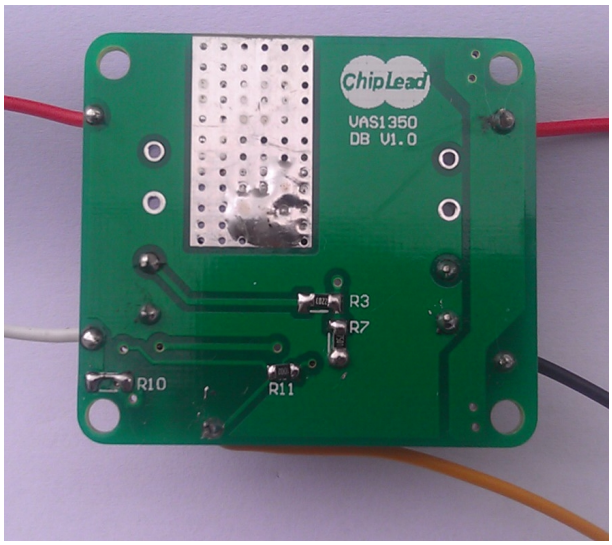
⑤、回路简单，稳定性好，无需环路补偿电容

1.2 输入输出特性

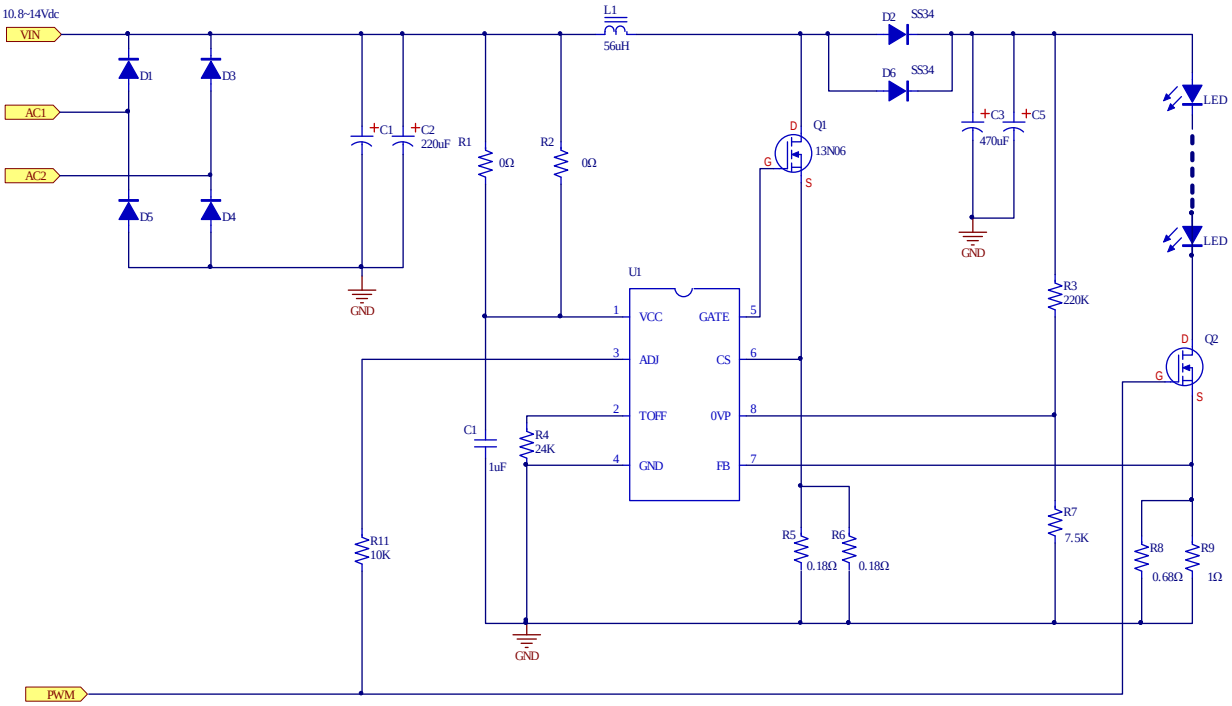
输入电压		10.8~14.0Vdc
输出电压		16~25V
输出电流		0.78A
效率		85%
PWM	幅度	3.3V
	频率	1K Hz
	占空比	0~100%

1.3 照片



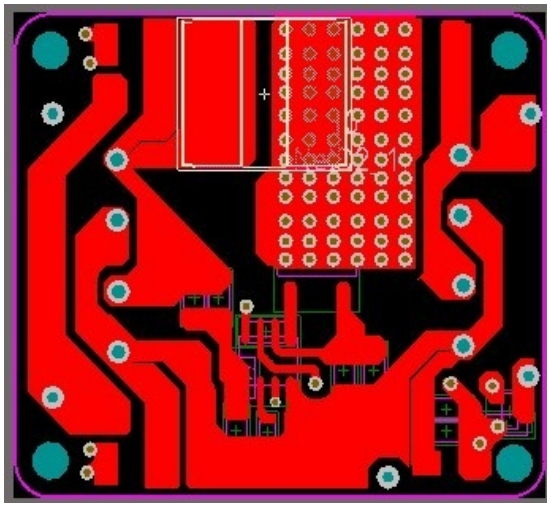


1.4 回路图

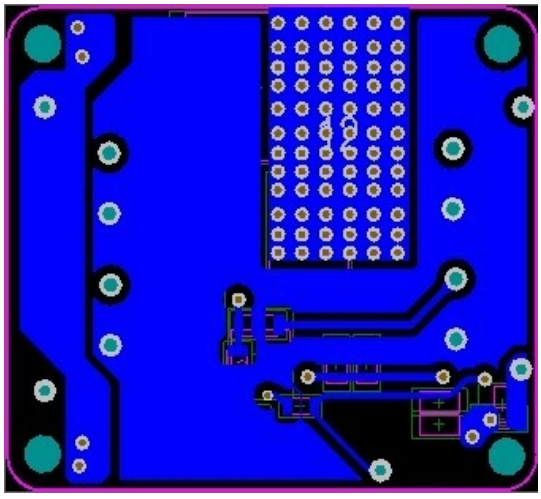


1.5 PCB板

顶层布线



底层布线



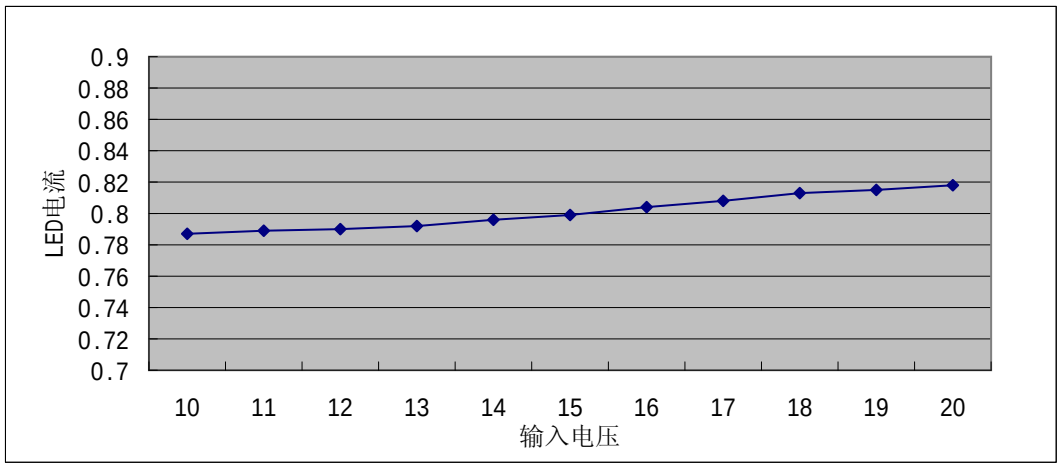
1.6 材料表

Components	PRATS	QTY	Vendor
Resistor			
R1 R2	0Ω 0805 ±5%	2	
R3	220K 0805 ±5%	1	
R4	24K 0805 ±5%	1	
R5 R6	0.18Ω 1206 ±1%	2	
R7	7.5K 0805 ±5%	1	
R8	0.68Ω 1206 ±1%	1	
R9	1Ω 1206 ±1%	1	
Capacitor			
C1	1uF 50V 1206	1	
C2	220UF 25V 8*12	1	
C5	470UF 50V 10*16	1	
DIODES			
D2 D6	DIODES SS34 3A 40V SMC	2	
IC and MOS			
U1	Controller VSA1350 SOP-8	1	Chip-lead
Q1	NMOS 13N06L 13.6A 60V TO-252	1	
Choke			
L1	56uH 12*12*6mm	1	

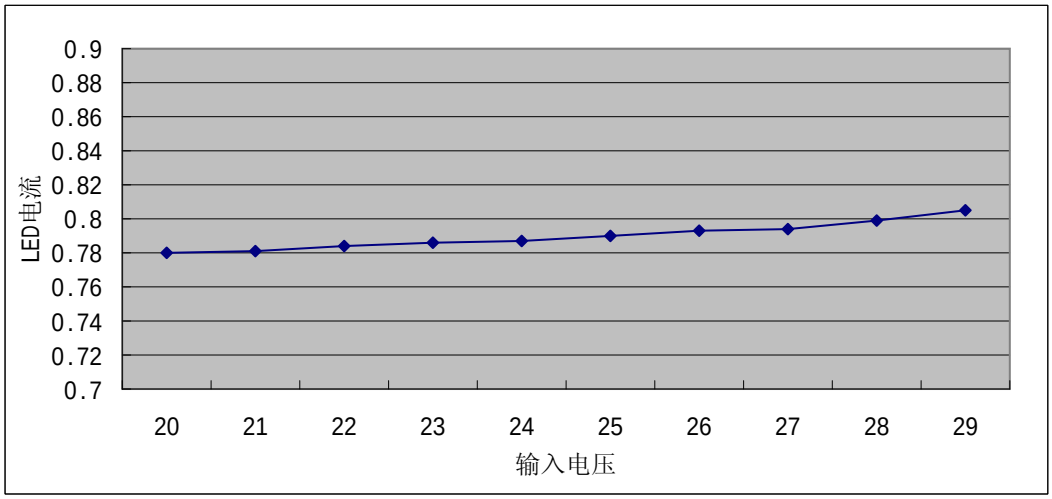
2. 电气特性

2.1 输入电压与输出电流曲线图

输出电压：24V



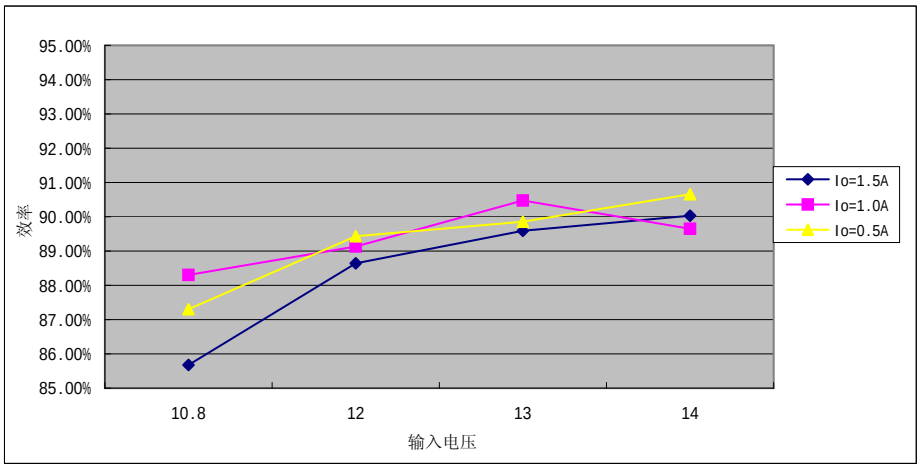
输出电压：36V



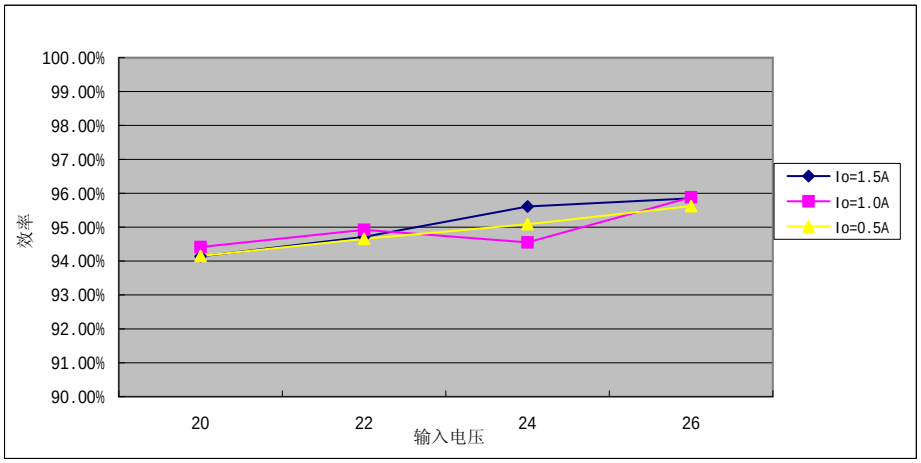
通过以上曲线图对比：
输入电压在变化，输出电流变化量很小，基本恒定在一定值，恒流精度很好。

2.2 效率与输出电流曲线图

输出电压：24V



输出电压：36V

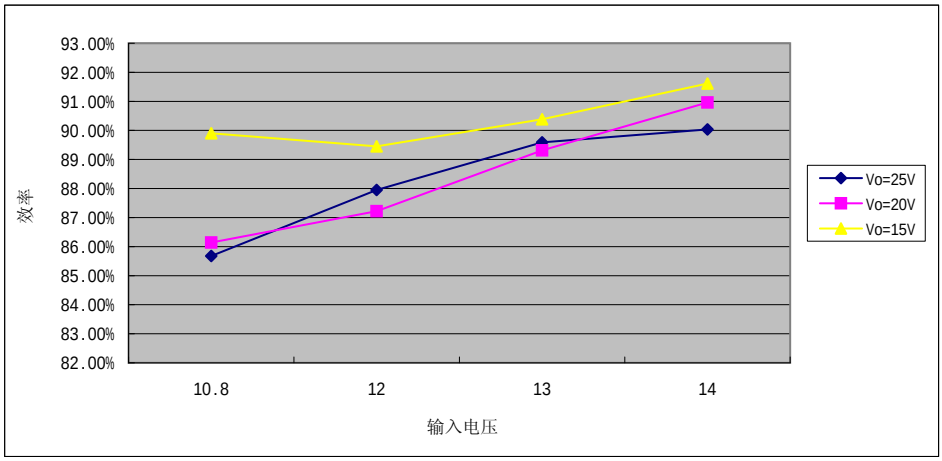


通过以上曲线图对比：

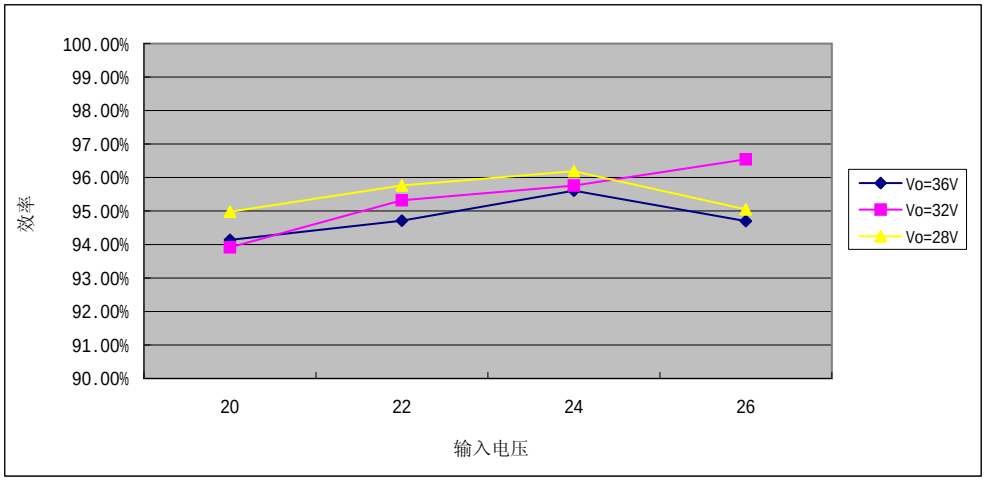
同样的输出电压和输出电压，输入电流越大，效率越低。

2.3 效率与输出电压关系曲线图

输出电流：1.5A



输出电流：1.5A



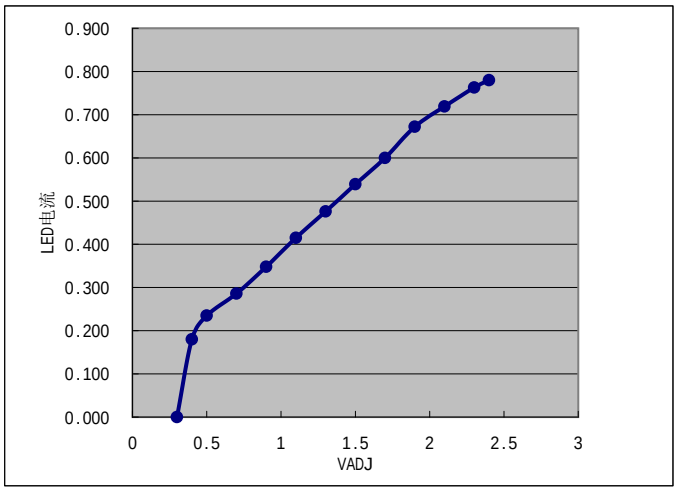
通过以上曲线图对比：
同样的输入电压和输出电流，输出电压越高，效率越低

做大电流输出，元器件选择给如下建议：
1、选择导通电阻R_{ds}小、栅源寄生电容C_{gs}小的MOS
2、选择磁损小、阻抗小的电感
3、使用导通压降低、反向恢复时间较快的肖特基

2.4 调光效果

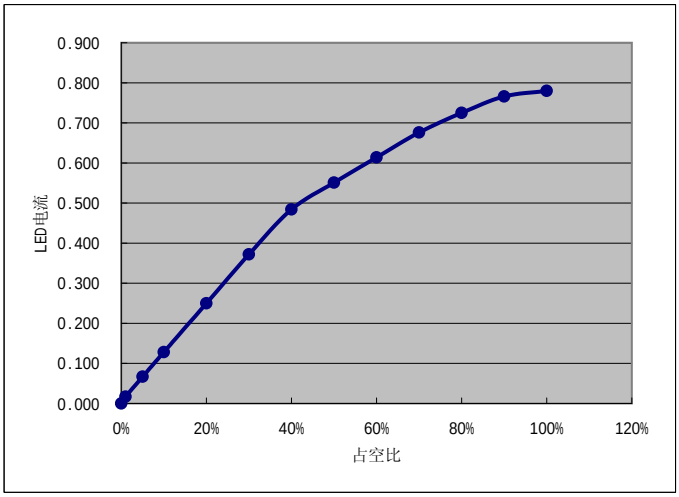
2.4.1 ADJ外加直流电压调光

V_{ADJ}(V)	Io(A)
0.3	0.000
0.4	0.180
0.5	0.235
0.7	0.286
0.9	0.348
1.1	0.415
1.3	0.476
1.5	0.539
1.7	0.600
1.9	0.672
2.1	0.719
2.3	0.763
2.4	0.780



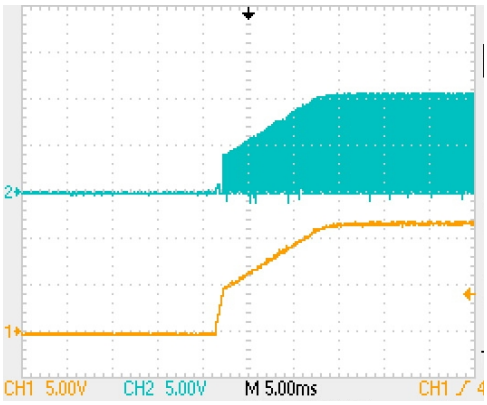
2.4.2 ADJ外加PWM信号调光

V_{ADJ}(V)	Io(A)
0%	0.000
1%	0.017
5%	0.067
10%	0.128
20%	0.250
30%	0.372
40%	0.484
50%	0.551
60%	0.614
70%	0.676
80%	0.725
90%	0.766
100%	0.780



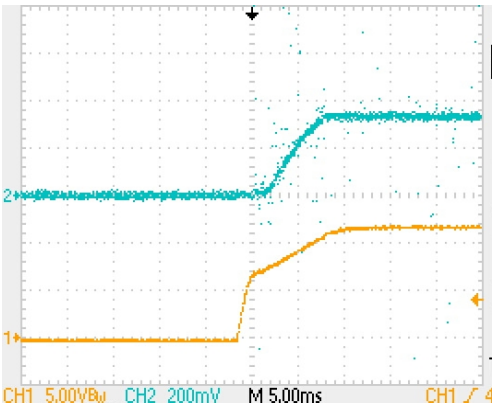
3.测试波形(V_{IN}=12V V_O=24V I_O=0.78A)

3.1. 启动状态



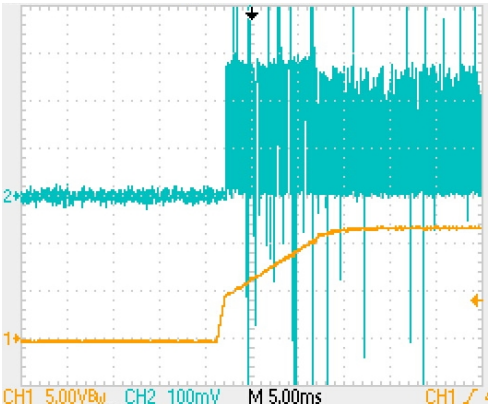
CH2:GATE

CH1:V_{IN}



CH2:FB

CH1:V_{IN}



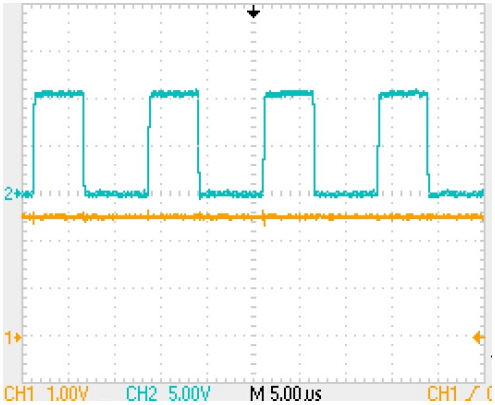
CH2:CS

CH1:V_{IN}

3.2 调光状态

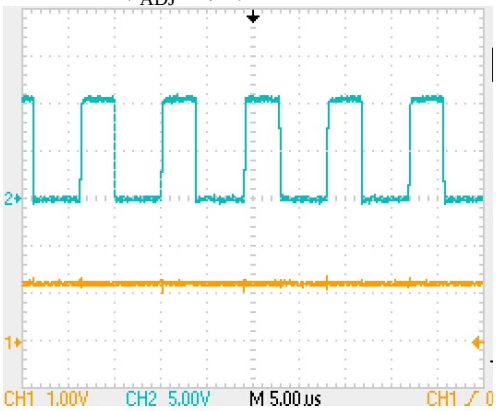
3.2.1.ADJ外加直流电压调光

V_{ADJ}=2.5V

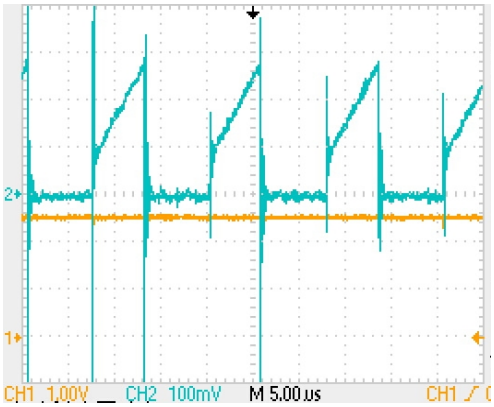


CH2:GATE
CH1:ADJ

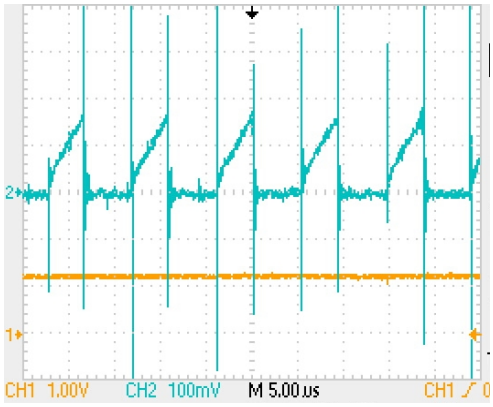
V_{ADJ}=1.2V



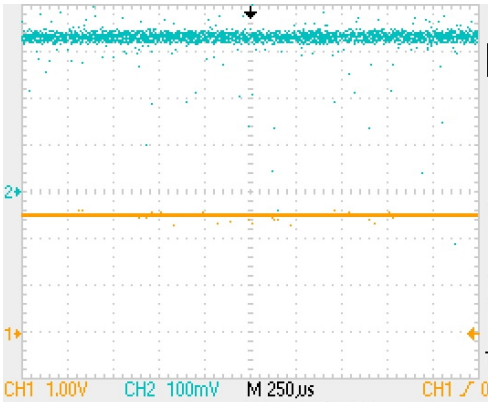
CH2:GATE
CH1:ADJ



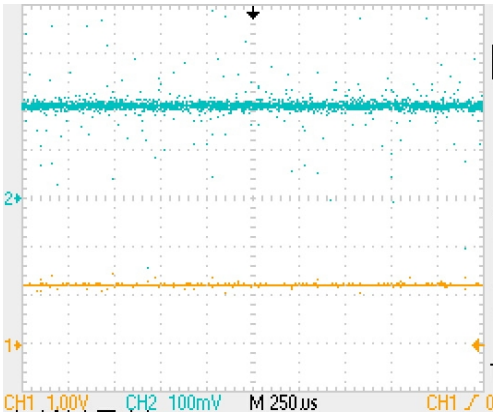
CH2:CS
CH1:ADJ



CH2:CS
CH1:ADJ



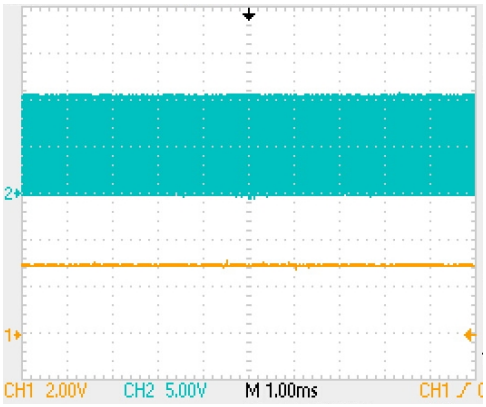
CH2:FB
CH1:ADJ



CH2:FB
CH1:ADJ

3.2.2.ADJ外加PWM信号调光

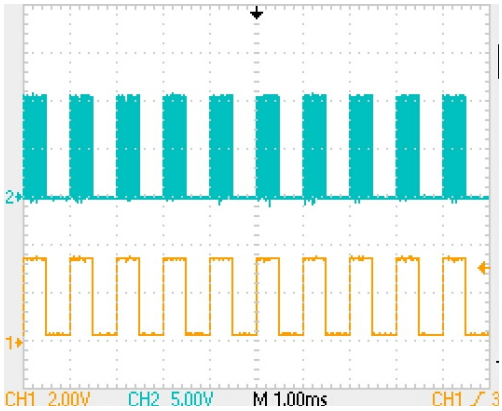
Duty=100%



CH2:GATE

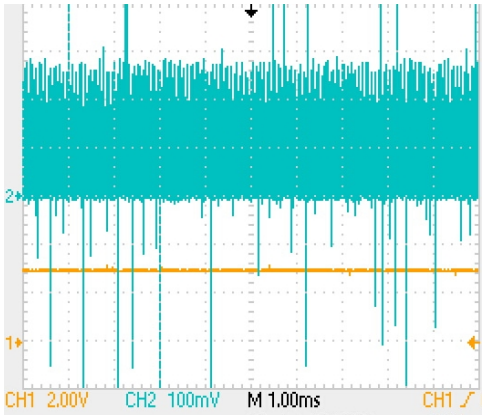
CH1:ADJ

Duty=50%



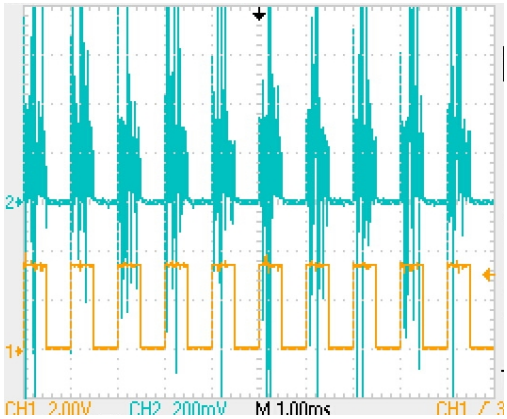
CH2:GATE

CH1:ADJ



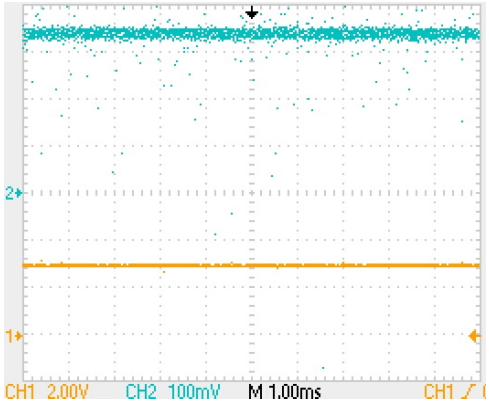
CH2:CS

CH1:ADJ



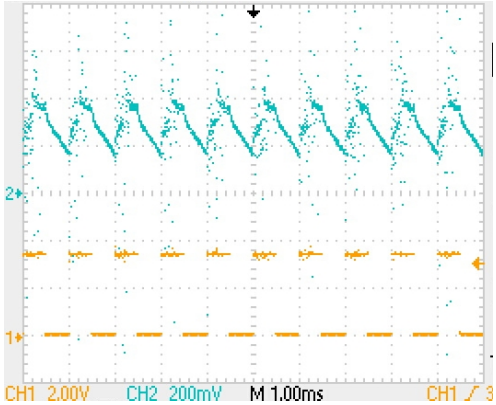
CH2:CS

CH1:ADJ



CH2:FB

CH1:ADJ

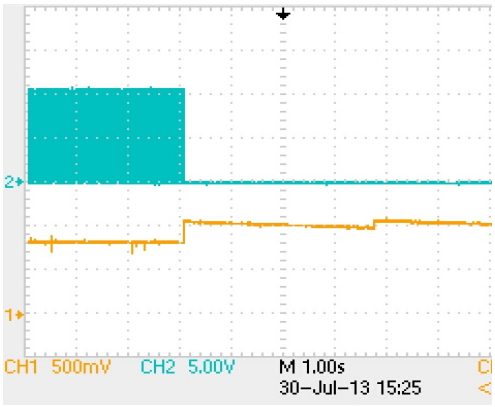


CH2:FB

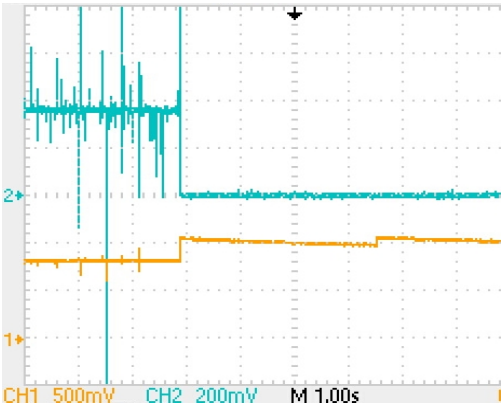
CH1:ADJ

3.3. 保护功能

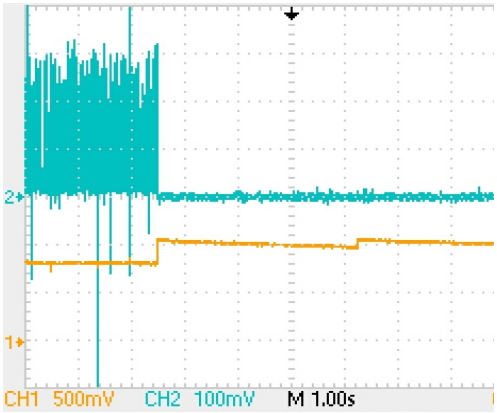
LED开路保护



CH2:GATE
CH1:OVP



CH2:FB
CH1:OVP



CH2:CS
CH1:OVP