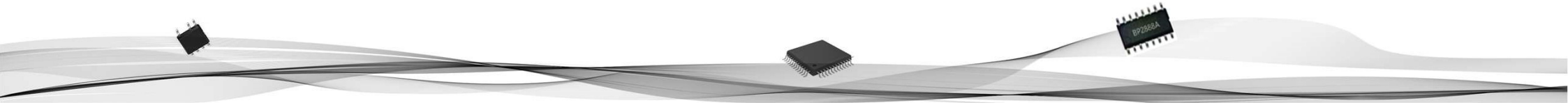
晶丰明源
Bright Power Semiconductor
— 股票代码：688368 —

# BP2628+BP3179F 60W
# 两级无频闪方案介绍

中功率灯具产品线

上海晶丰明源半导体股份有限公司



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## ■方案背景介绍

- 适合中大功率高PF无频闪灯具照明应用；
- 适合全电压和单电压100W以内功率；
- 易于调试的应用结构；
- 可兼容智能调光控制；

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## ■方案芯片主要特性

➢ BP2628

- ◆临界峰值电流控制模式
- ◆精准恒压反馈
- ◆BCM 和 DCM 混合模式控制
- ◆ 低谐波<5%和高 PF
- ◆完善的保护功能

➢ BP3179F

- ◆准谐振临界导通模式
- ◆精准的原边恒流控制（PSR）
- ◆可以兼容PWM调光应用
- ◆功率可应用到100W
- ◆完善的保护功能

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## ■方案电气性能参数[拨码开关功率:30/40/50/60W]

| 参数 | 符号 | 性能参考值 |
|---|---|---|
| 交流输入电压 | Vin | 176V(ac) ~ 264V（ac） |
| 功率因数 | PF | 0.99(Vin=220V) |
| 电流谐波 | THD | <5%@220Vac |
| LED 输出电压 | Vout(LED) | 24~42V(dc) |
| LED 输出电流 | Iout(LED) | 1.5A(dc) |
| LED 输出电流纹波 | ΔIout(LED)_ripple/ Iout(LED) | ±5%( Iout(LED)=1.5A) |
| 输入调整率 | ΔIout(LED) / ΔVin | ±1%(Vin=176~264Vac) |
| 输出调整率 | ΔIout(LED) / ΔV out(LED) | ±3%(Vout(LED)=24~40Vdc) |
| 效率 | η | 88.9%(Vin=220Vac/Vout=40V) |
| 驱动DEMO尺寸 | PCB size | 138*38* 20mm(L/W/H) |
| 电磁兼容标准 | EMI/EMC | EN55015 |

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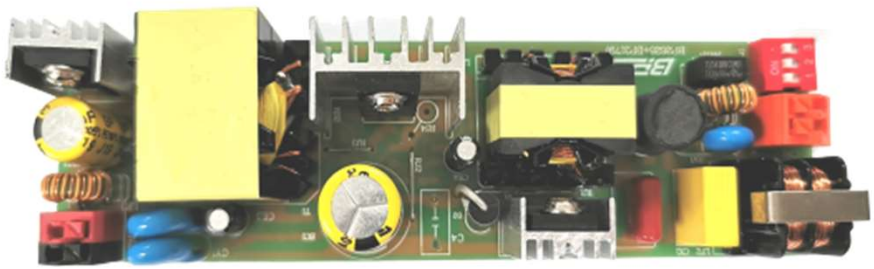
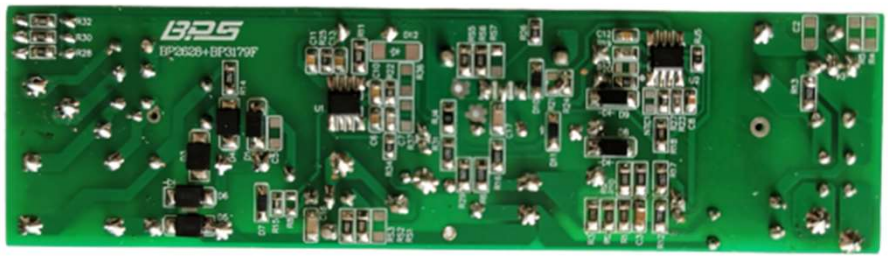
## ■方案DEMO图片





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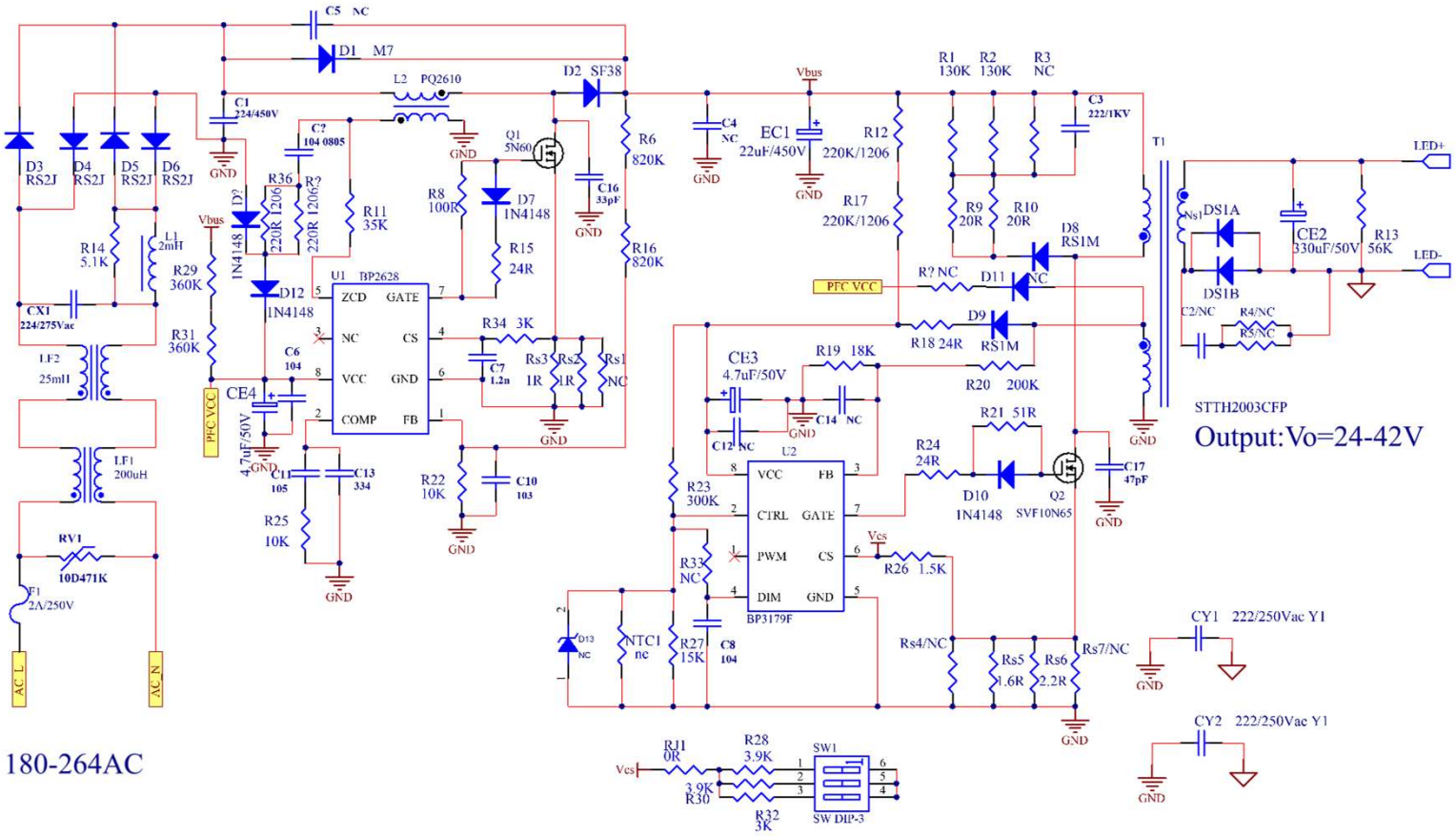
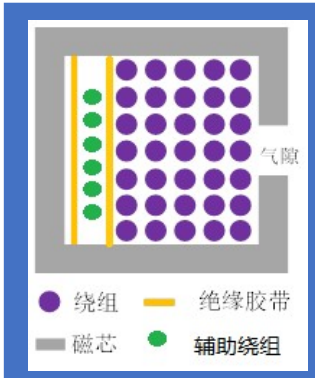
## ■方案线路图

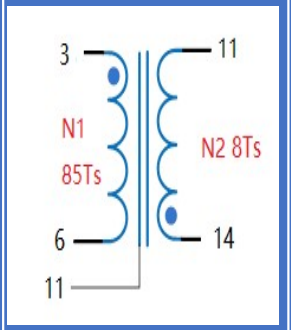


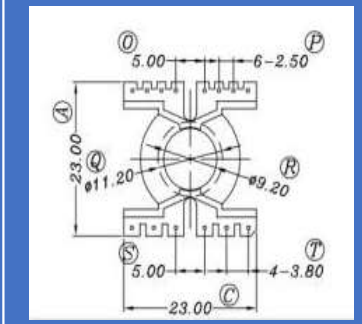
# BP2628+BP3179F 60W 两级无频闪方案介绍

## ■主要磁芯元件

Boost 电感:L3-6=1.3mH



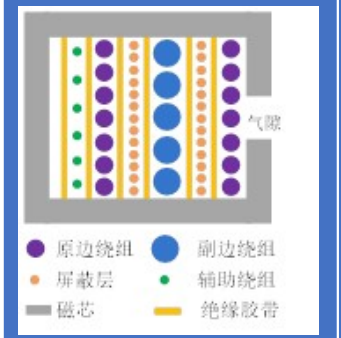



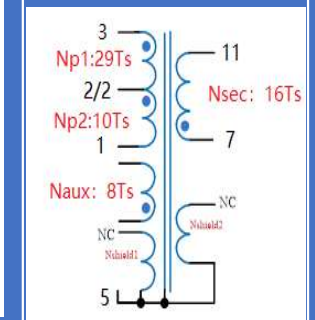



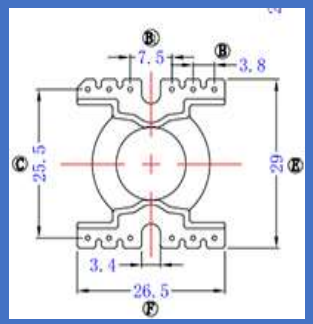

| 绕线顺序 | 电气原理图 | PQ2016骨架针距和排距尺寸图 |
|---|---|---|

| 绕组顺序 | 起始S | 结尾F | 线径及规格 | 匝数 | 层数 | 工艺要求及备注 |
|---|---|---|---|---|---|---|
| N1 | 3 | 6 | Φ0.2x3 2UEW-F 155℃ | 85 | 绕多层 | 密绕，顺时针 |
| N2 | 14 | 11 | Φ0.2 2UEW-F 155℃ | 8 | 绕多层 | 密绕，顺时针 |
| | 11 | | Φ0.2 2UEW-F 155℃ | 11pin铜线留10mm漏锡5mm压贴到磁芯 | | |

Flyback变压器:L3-1=750uH




| 绕线顺序 | 电气原理图 | PQ2620骨架针距和排距尺寸图 |
|---|---|---|

| 绕组顺序 | 起始S | 结尾F | 线径及规格 | 匝数 | 层数 | 工艺要求 |
|---|---|---|---|---|---|---|
| Np1 | 3 | 2 | Φ0.2mmx4 2UEW 多股线 | 29 | 2 | 密绕满层（可以适当调整线径） |
| Nshield1 | 5 | - | Φ0.17mm 2UEW | | 1 | 密绕满层，顺时针 |
| Ns | 7 | 11 | Φ0.4x2 TEX-F | 16 | 2 | 密绕满层（可以适当调整线径 |
| Nshield2 | 5 | - | Φ0.13mm 2UEW | | 1 | 密绕 |
| Np2 | 2 | 1 | Φ0.2mmx4 2UEW 多股线 | 13 | 1 | 密绕满层（可以适当调整线径） |
| Naux | 4 | 5 | Φ0.2mm 2UEW | 8 | 1 | 疏绕 |

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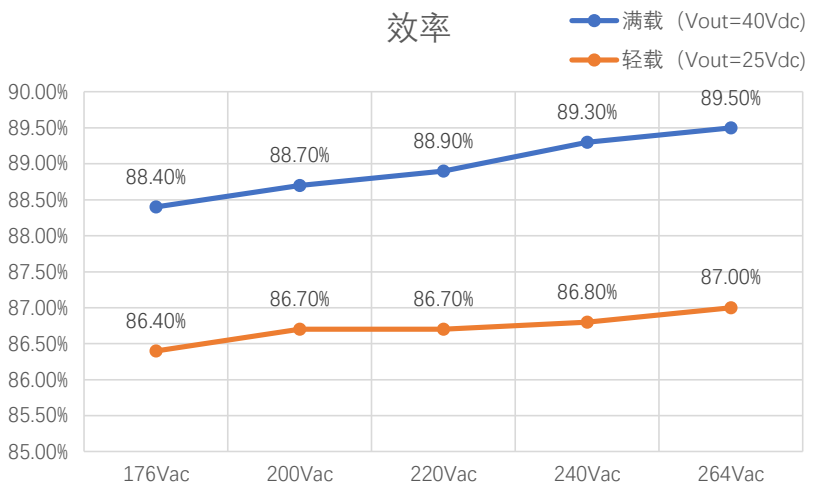
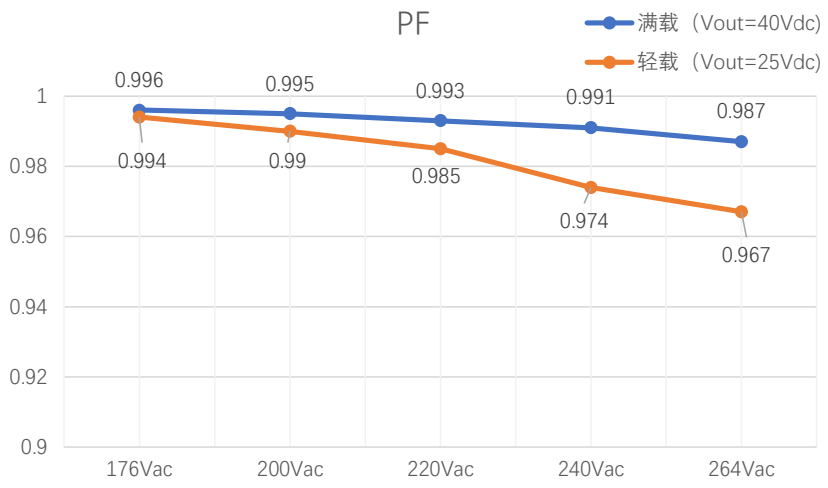
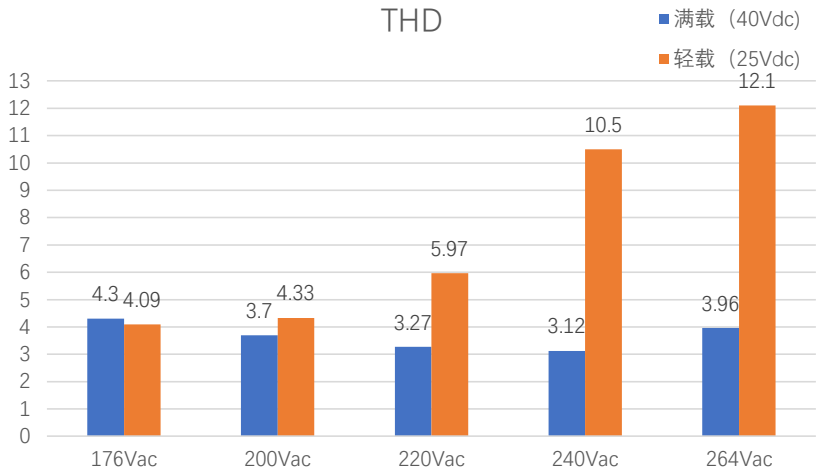
## ■方案电气性能测试值：

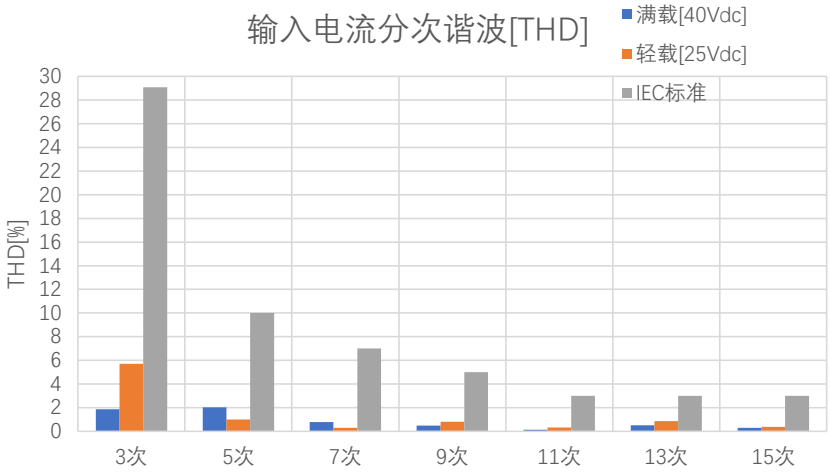


# BP2628+BP3179F 60W 两级无频闪方案介绍

## ■方案电气性能测试值：



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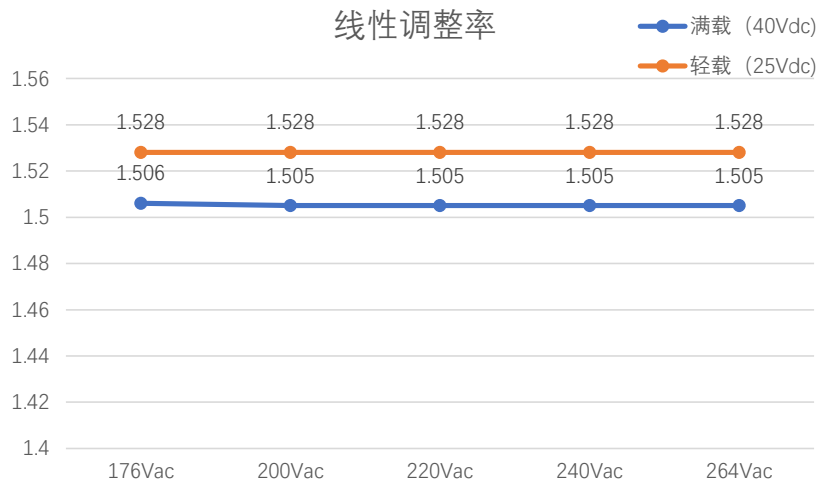
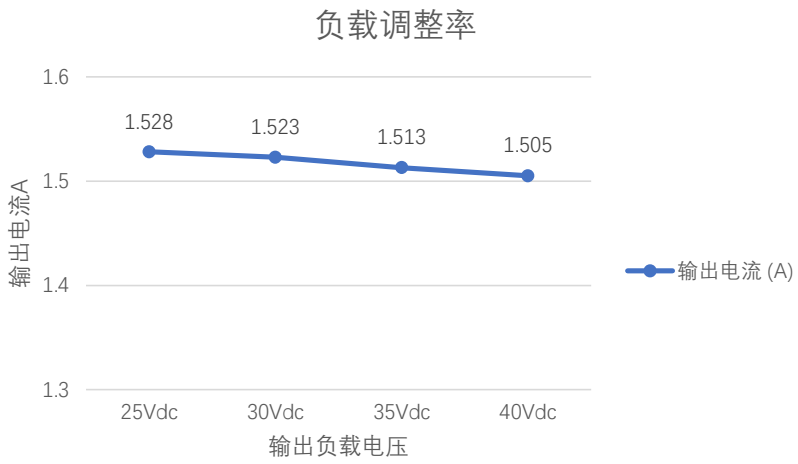
## ■方案电气性能测试值：



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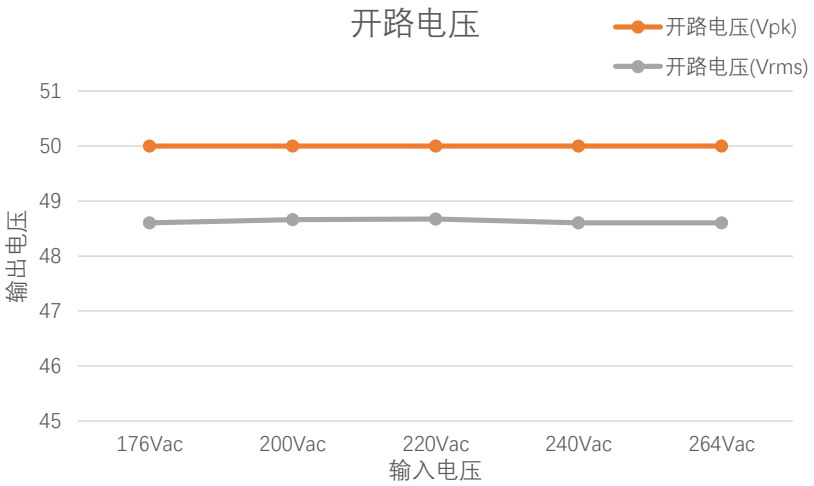
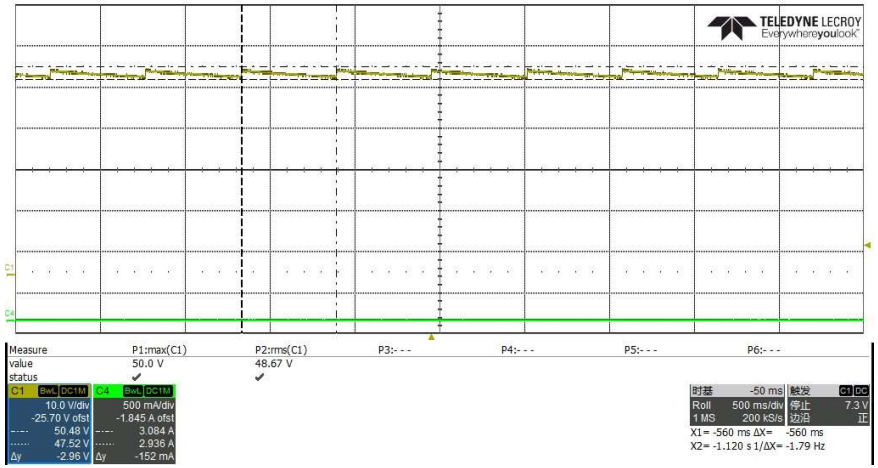
## ■方案电气性能测试值：

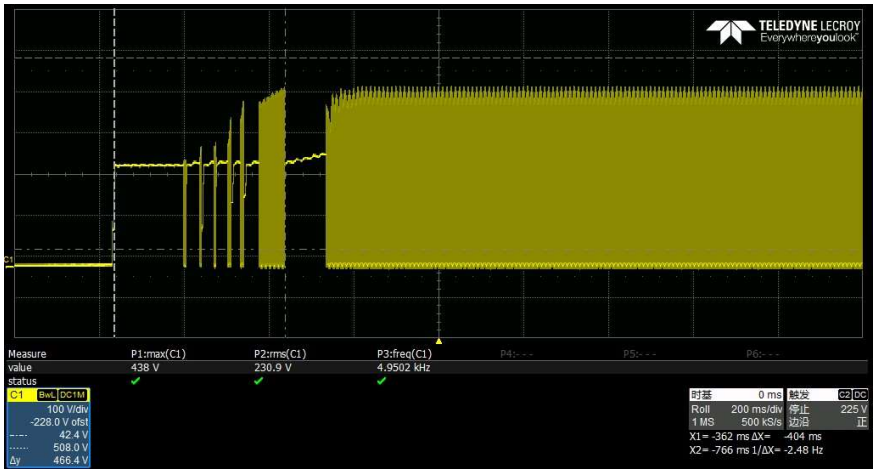


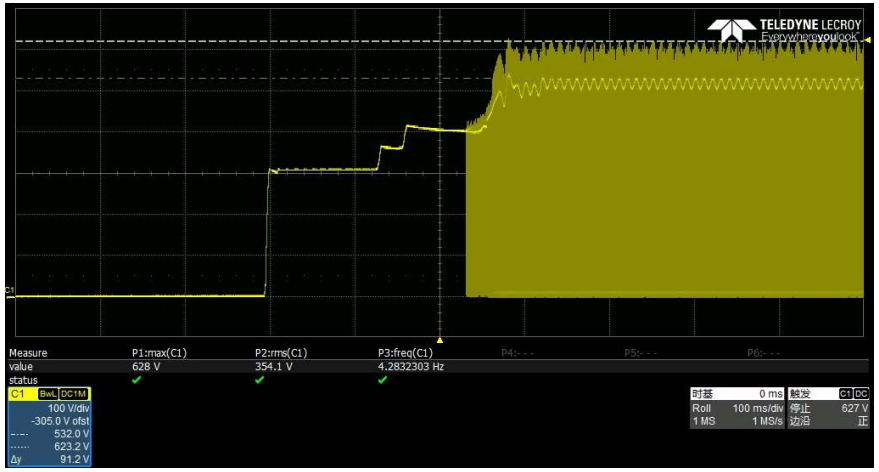
# BP2628+BP3179F 60W 两级无频闪方案介绍

## ■主要波形

Boost 启动波形




Flyback启动波形




- 启动时，Boost 和反激的MOSFET无明显电压无过冲；

# BP2628+BP3179F 60W 两级无频闪方案介绍

## ■主要波形

Boost 正常工作波形

CH2:Vds　CH4:电感电流

Flyback 正常工作波形

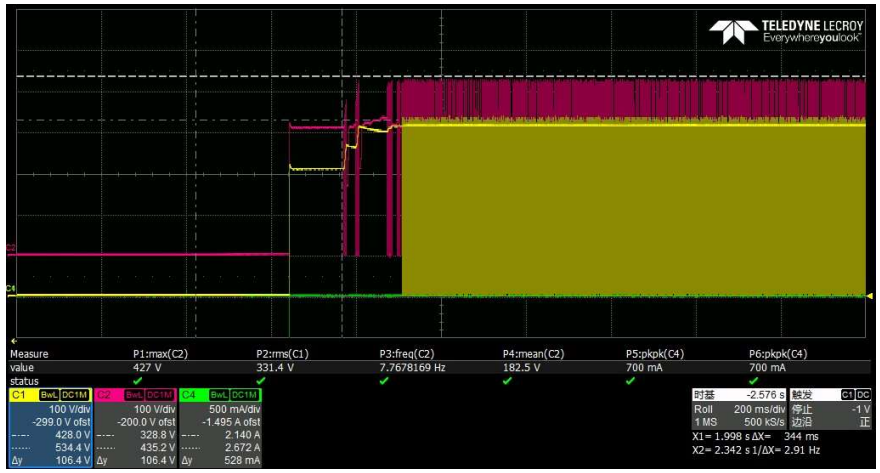
CH1:Vds　CH2:CS波形

- Boost 和Flyback 电感最大饱和磁通密度分别为:0.26/0.26;

# BP2628+BP3179F 60W 两级无频闪方案介绍

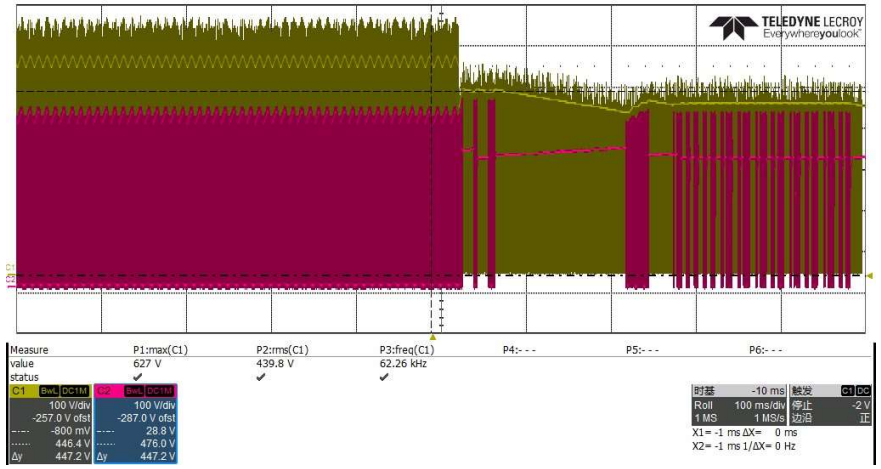
## ■主要波形

输出短路启动波形- Boost和Flyback的Vds




CH2:PFC升压Vds　CH1:反激Vds

正常带载到短路波形- Boost和Flyback的Vds




CH2:PFC升压Vds　CH1:反激Vds

- 输出短路启动和正常带载到短路异常工作时，Boost 和Flyback的MOSFET最大电压分别为：440V/620V，无明显异常过冲尖峰电压；

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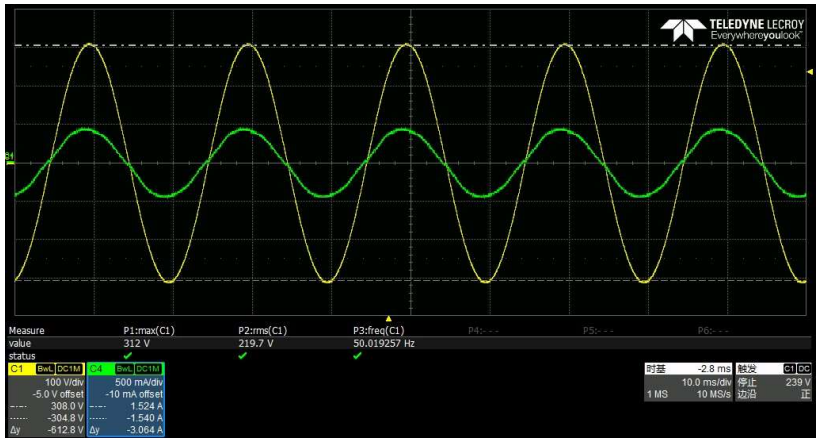
## ■主要波形

交流输入电流、电压波形@220Vac




CH1:输入AC电压　CH4:输入电流波形

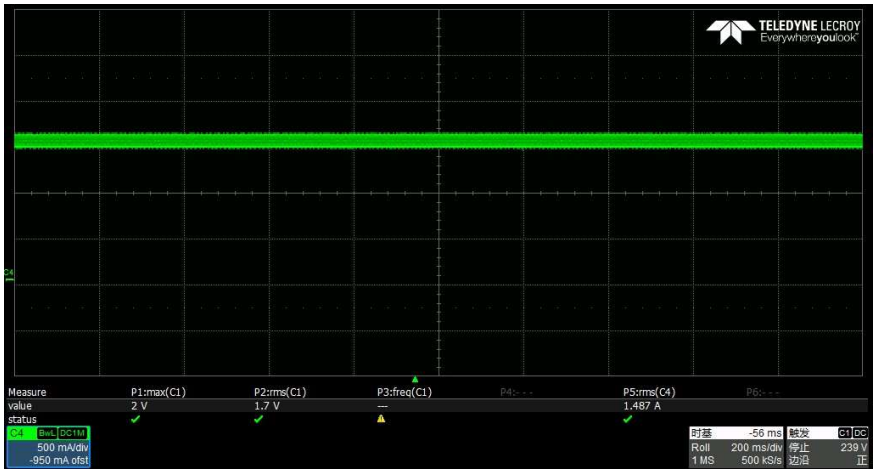
交流输入电流、电压波形@264Vac

CH1:输入AC电压　CH4:输入电流波形

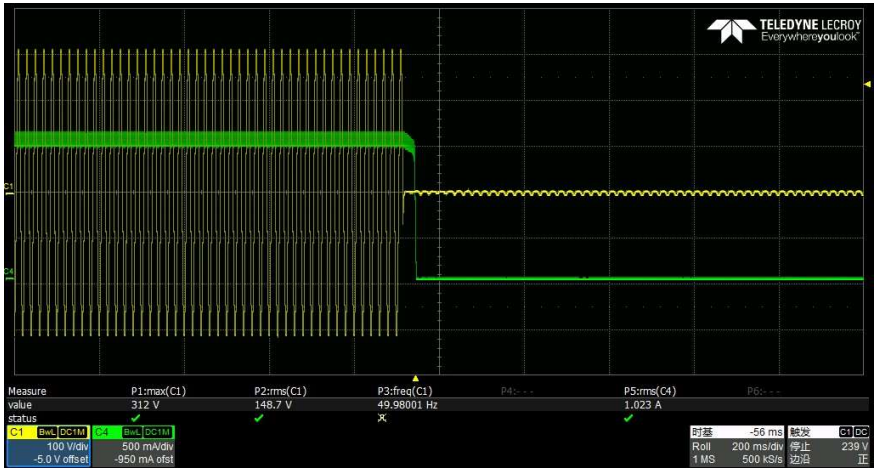
# BP2628+BP3179F 60W 两级无频闪方案介绍

## ■主要波形

满载输出电流波形




关机输出电流波形




CH1:输入AC电压　CH4:输入电流波形

- 输出电流纹波150mA,ΔIout<±5%;
- 输出电流波形在关机瞬间无过冲;

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## ■关键元件温升测试

| | Location | MAX LOAD LED-38V | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 170 Vac/45ºC | 230 Vac/45ºC | 230 Vac/50ºC | 230 Vac/60ºC | 230 Vac/70ºC | 230 Vac/80ºC | 230 Vac/90ºC |
| PFC电感 | L2c | 77.9 | 73.1 | 76.7 | 85.8 | 95.9 | 107.3 | 117.8 |
| 升压MOS | Q1 | 71.5 | 69.2 | 73.5 | 82.9 | 93.59 | 105 | 115.7 |
| 升压二极管 | D2 | 64.6 | 63.8 | 70.5 | 79.9 | 90.5 | 101.8 | 112.3 |
| 反激MOS | Q2(HS2) | 93.8 | 93.4 | 97.7 | 107.59 | 119.4 | 130.7 | 137 |
| 反激变压器 | T1w | 87.5 | 88.0 | 91.4 | 100.59 | 112.1 | 123.69 | 134.1 |
| 输出二极管 | DS1 | 91.4 | 91.3 | 95.2 | 103.9 | 113.3 | 123.7 | 132.7 |
| PFC主控 | U1 | 72.1 | 70.0 | 75.4 | 84.1 | 94.3 | 105.4 | 116.1 |
| 反激主控 | U2 | 80.0 | 80.9 | 86.0 | 95 | 105.6 | 117.6 | 128.9 |

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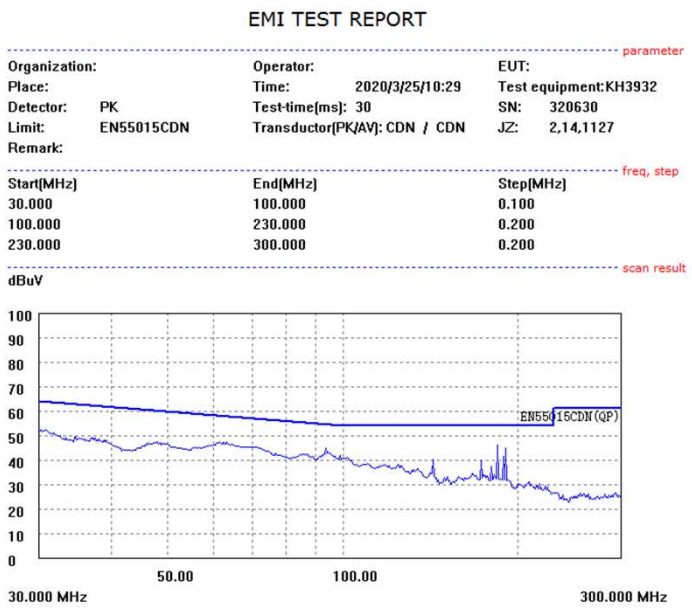
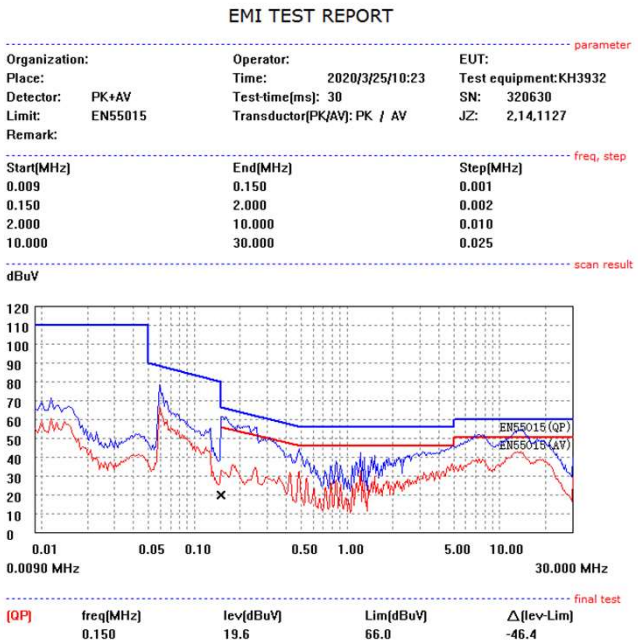
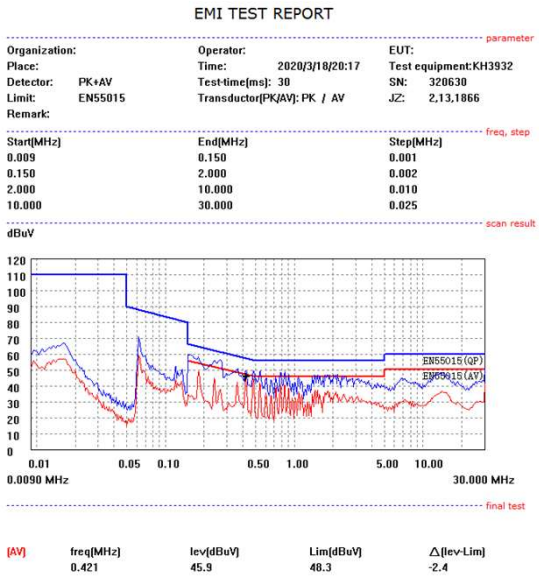
## ■EMI测试

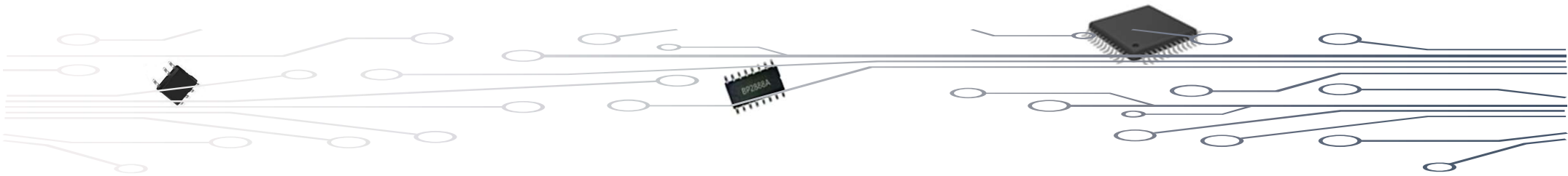



CDN:辐射波形结果




传导波形结果-N




传导波形结果-L

# 谢 谢 ！