# AT6001 (12V4A) 樣機

COC V5.0 Tier2 & DOE V6.0 :

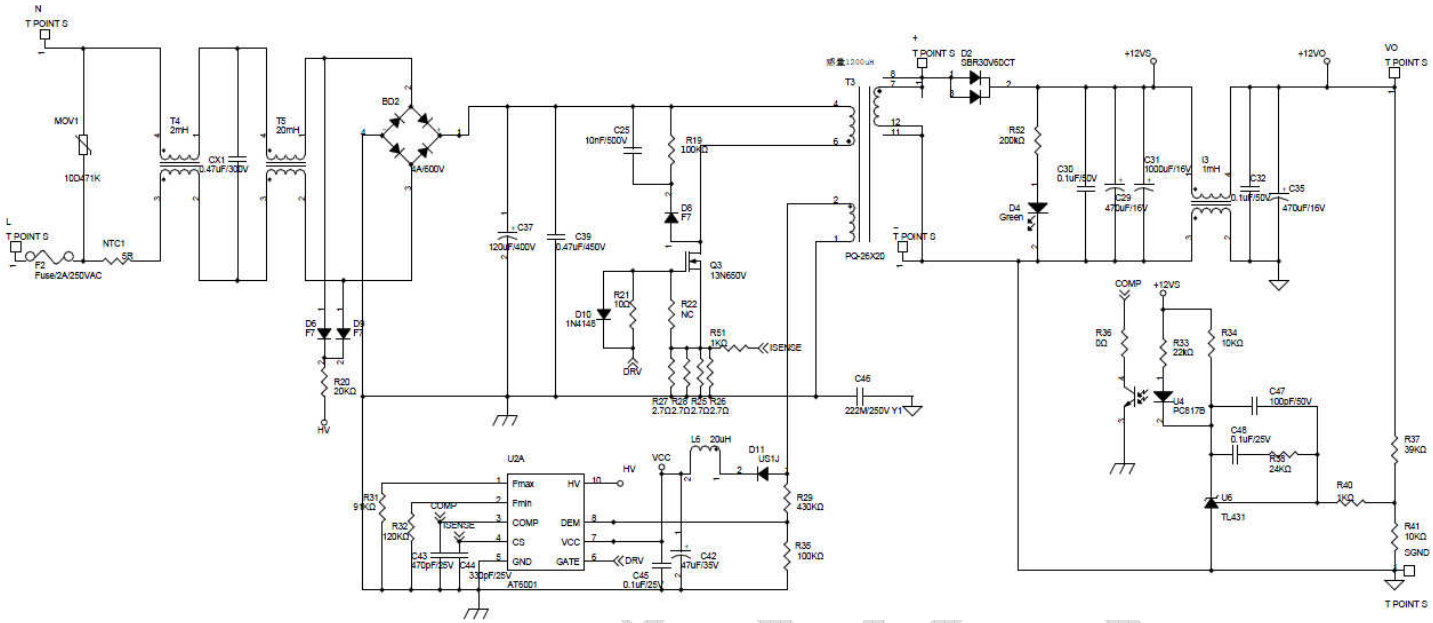
## 欧盟委员会外部电源行为准则CoC version 5

欧盟委员会外部电源(EPS)行为准则CoC第5版属于自愿性标准，第一阶段拟生效日起为2014年1月1日，第二阶段拟生效日起为2016年1月1日；12V 4A（48W）， 第二阶段要求待机低于75mW,平均效率超过88.96%；

## 美国能源之星DoE version 6

美国能源部（DoE)对外部供电电源的提出了更高的要求，相较第5版，平均效率要求（在25%、50%、75%和100%负载水平下测得的效率的平均值）提升很多，在待机方面要求更严格；拟生效日期为2016年1月1日；12V 4A（48W）， 要求待机低于100mW,平均效率超过88%；

# AT6001 12V/4A 樣機線路圖:



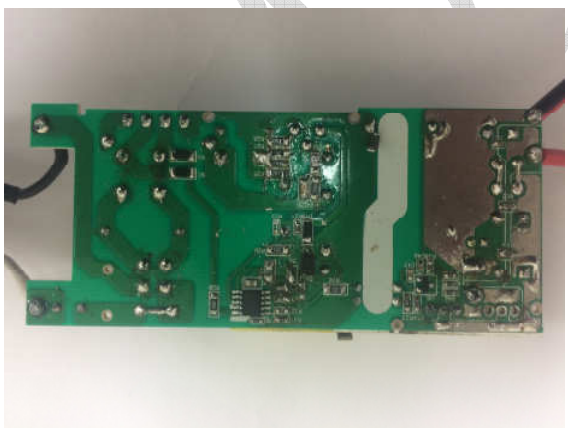

主要元件：

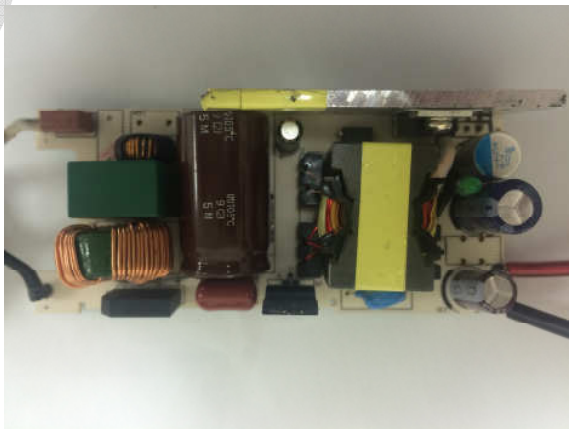
变压器:**PQ2620**；

**MOS 管：13N65；**

肖特基（1颗）：**SBR30V60**；

芯片:**AT6001**





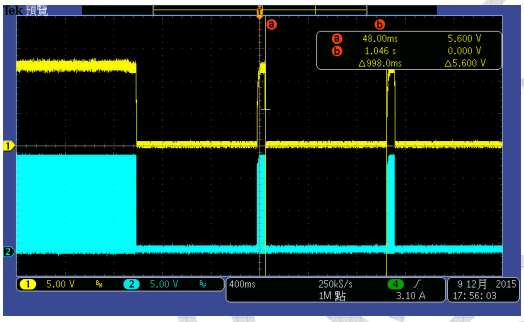
## 1. No Load Power Consumption

| Vin (Vac) | Pin (mW) |
|---|---|
| 90(60Hz) | 32 |
| 115(60Hz) | 35 |
| 230(50Hz) | 59 |
| 240(50Hz) | 62 |

## 2. Over Current Protection

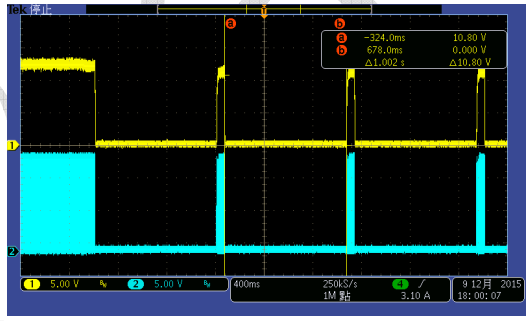
## (LEB filter Rcsf=1k ,Ccsf=330pF)

90Vac 4.46 A mode Auto restart



Ch1: Vout Ch2: Gate

264Vac 4.85A mode Auto restart



Ch1: Vout Ch2: Gate

## 3. Line & load regulation (線端)

Output current :0A

| Input voltage | 90V | 110V | 230V | 264V |
|---|---|---|---|---|
| Output voltage | 12.237 | 12.235 | 12.237 | 12.238 |

Output current :2A

| Input voltage | 90V | 110V | 230V | 264V |
|---|---|---|---|---|
| Output voltage | 12.148 | 12.147 | 12.140 | 12.143 |

Output current :4A

| Input voltage | 90V | 110V | 230V | 264V |
|---|---|---|---|---|
| Output voltage | 12.058 | 12.056 | 12.043 | 12.045 |

## 4. Efficiency

(spec: At 25%,50%,75%,100% load the average Effiency 線端>89%)

| Vin (Vac) | Efficiency (%) | | | | | 線端 Average (%) |
|---|---|---|---|---|---|---|
| | 0.4A(10%) | 1A(25%) | 2A(50%) | 3A(75%) | 4A(100%) | |
| 90V | 89.64% | 91.3% | 90.40% | 89.78% | 87.97% | 89.86% |
| 115V | 89.81% | 91.04 % | 91.29% | 89.88% | 88.75% | 90.24% |
| 230V | 88.09% | 90.59% | 91.25% | 91.19% | 90.75% | 90.95% |
| 264V | 87.19% | 90.26% | 91.03% | 91.07% | 92.22% | 90.07% |

備註：

熱機15分鐘,板端測試結果；

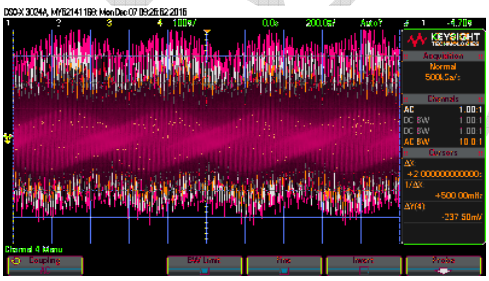
#16線材1.5米

负载机：Chroma 63106

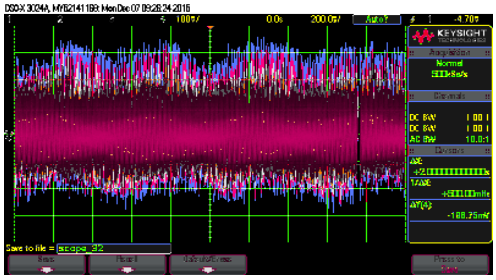
功率计：WZT210

## 5. Output Ripple & Noise

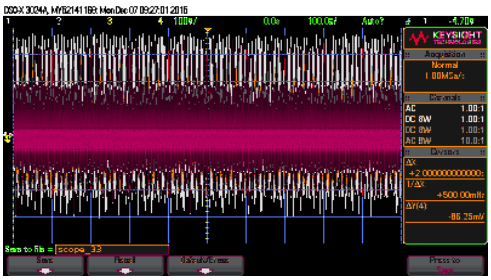
90Vac 4A 237.5mVpp



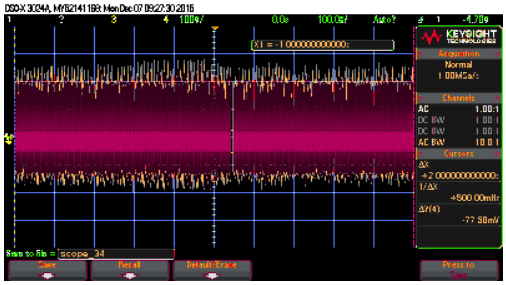
120Vac 4A 198.75mVpp



240Vac 4A 86.25mVpp

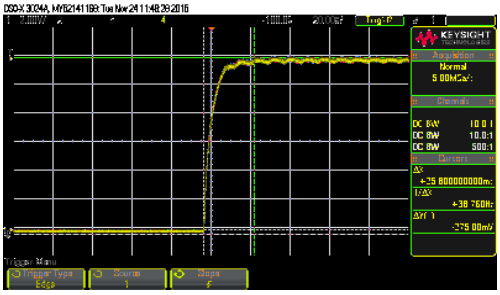


264Vac 4A 77.5mVpp

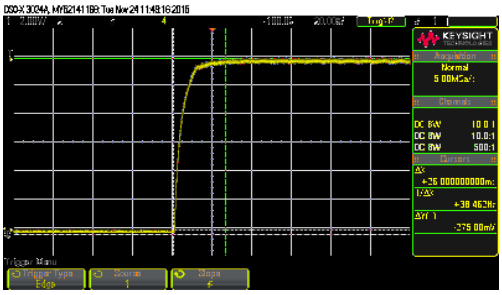


## 6. Turn-on Rising time

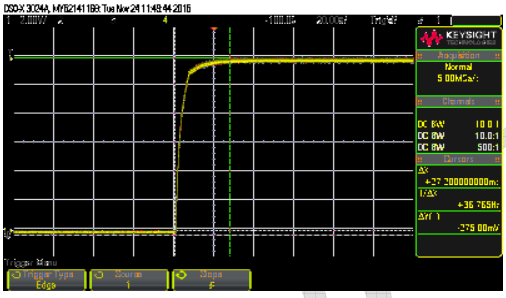
90Vac 4A 25.8mSec



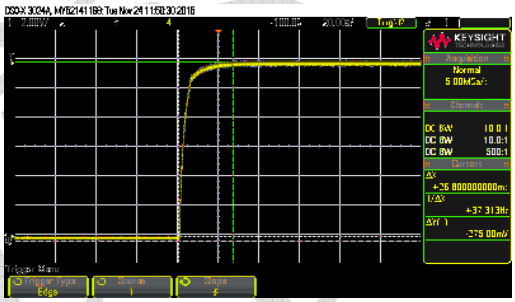
120Vac 4A 26mSec



230Vac 4A 27.2mSec

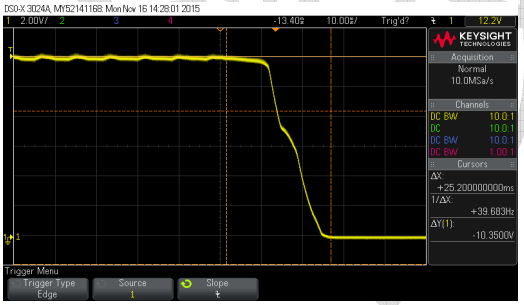


264Vac 4A 26.8mSec

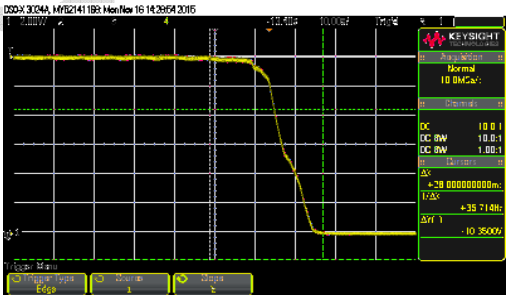


## Turn-off falling time

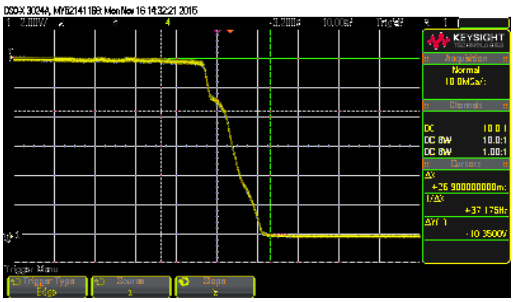
90Vac 4A 25.2mSec



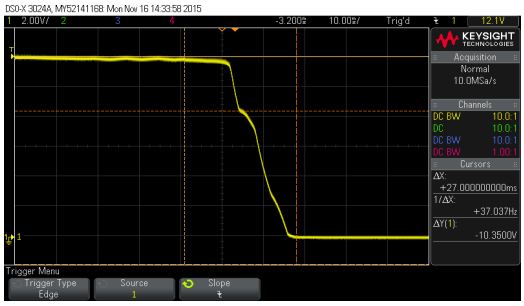
120Vac 4A 28mSec



230Vac 4A 26.9mSec

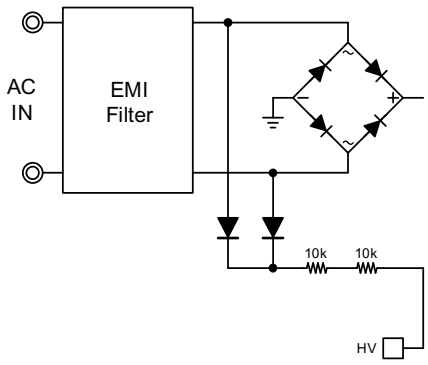


264Vac 4A 227mSec

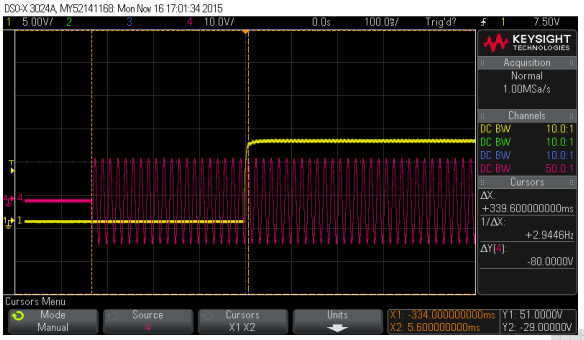


## 7. Turn On Delay Time

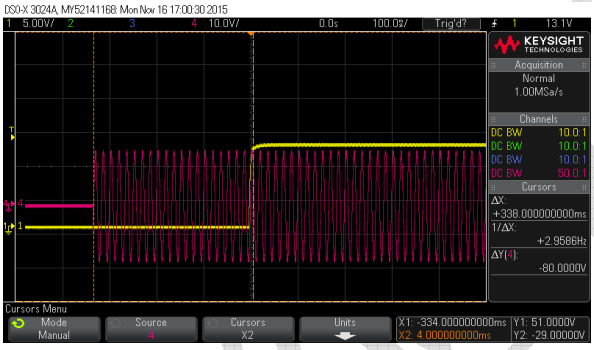
HV Startup from ACIN through two-diode connect with 20kΩ



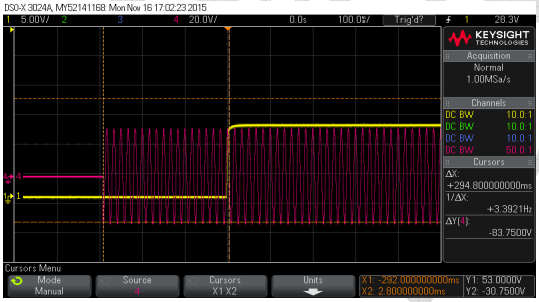

90Vac 4A 339mSec



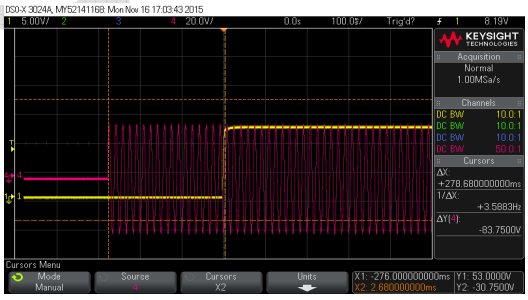

120Vac 4A 338mSec




230Vac 4A 294mSec

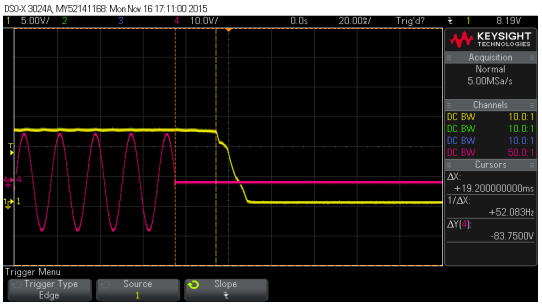



264Vac 4A 278mSec

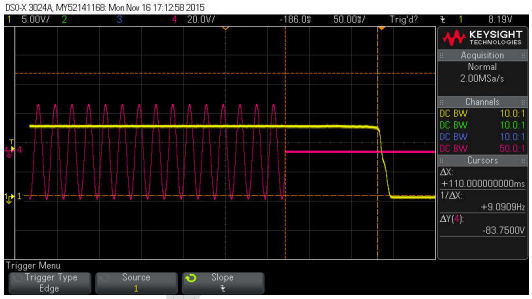


## 8. Hold Up Time

115Vac 4A 19.2mSec

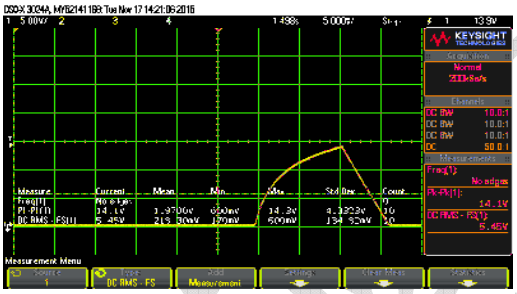


230Vac 4A 110mSec

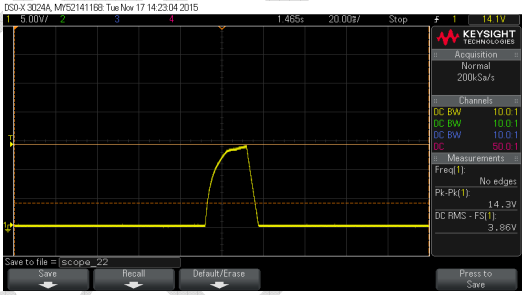


## 9. OVP test

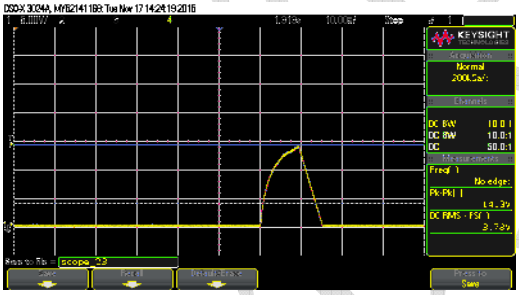
90Vac 4A 13.9V



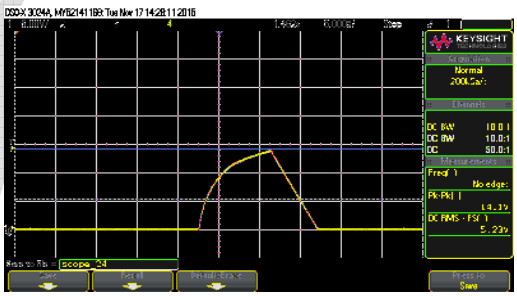
120Vac 4A 14.1V



240Vac 4A 14.1V

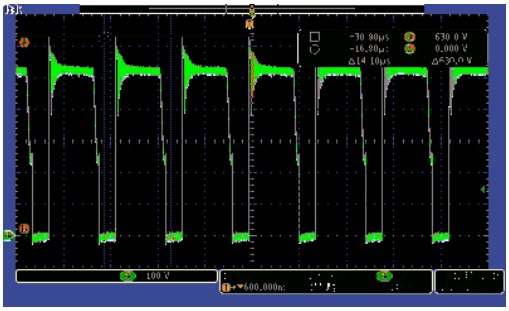


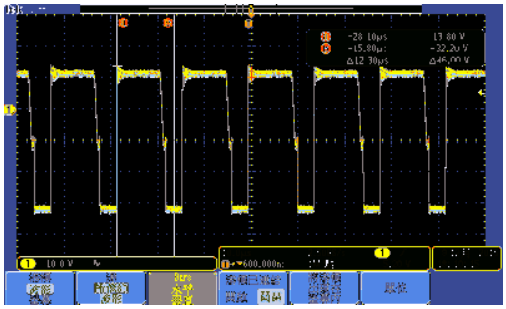
264Vac 4A 14.1V



## 10. Component stress waveform

264Vac 4A 1st MOS Vpeak: 630V 2nd Schottky Vpeak: 46V

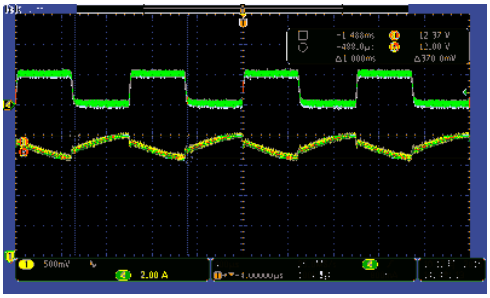




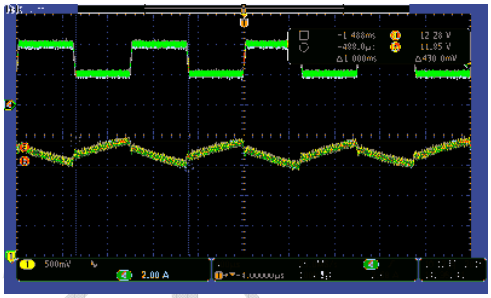
## 11. Dynamic load transient

## (0%~50% Load step,50%~100% Load step ,Slew rate : 0.1A/us)

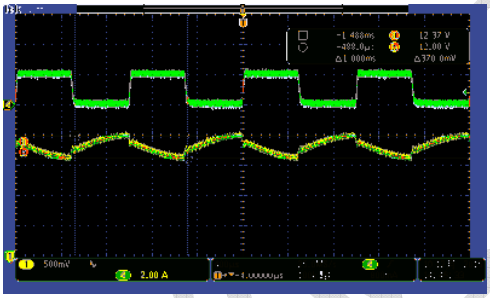
90Vac 0~50%  Vpk-pk: 314mV



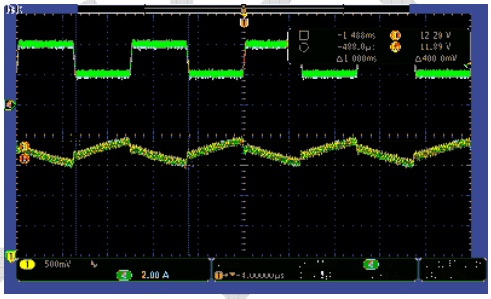
90Vac 50~100%  Vpk-pk: 390mV



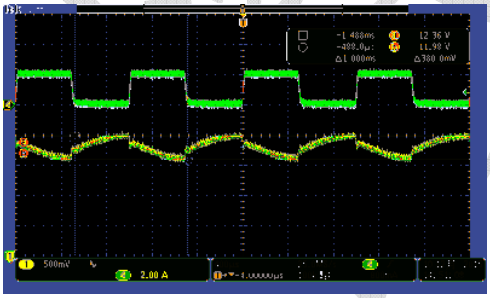
115Vac 0~50%  Vpk-pk: 370mV



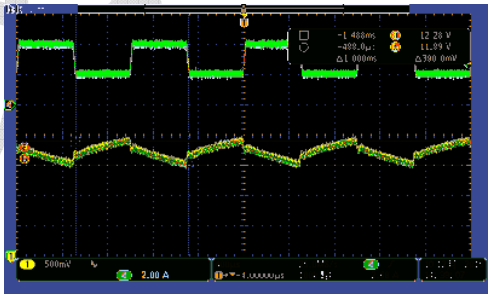
115Vac 50~100%  Vpk-pk: 430mV



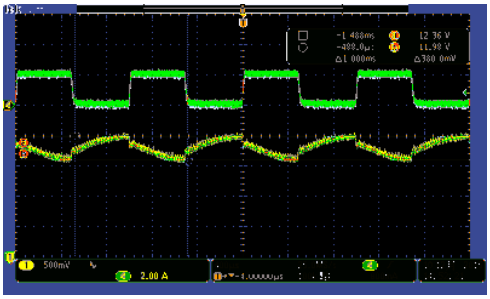
230Vac 0~50%  Vpk-pk: 370mV



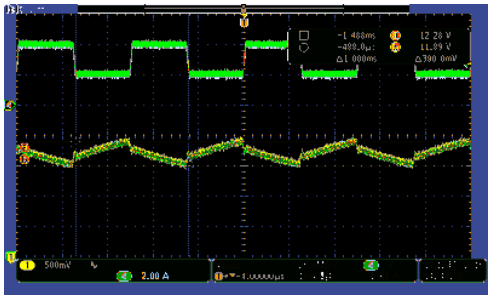
230Vac 50~100%  Vpk-pk: 400mV



264Vac 0~50%  Vpk-pk: 380mV



264Vac 50~100%  Vpk-pk: 390mV

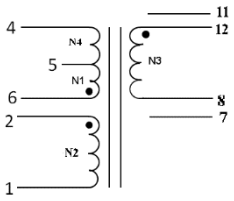


# AT6001 12V/4A 樣機元件表

| Value | Part Reference | PCB Footprint |
|---|---|---|
| T POINT S | + | 125R25 |
| T POINT S | - | 125R25 |
| 4A/600V | BD2 | GBP408 |
| 10nF/500V | C25 | C1206 |
| 470uF/16V | C29 | CE10 |
| 0.1uF/50V | C30 | C0805 |
| 1000uF/16V | C31 | CE10 |
| 0.1uF/50V | C32 | C0603 |
| 470uF/16V | C35 | CE10 |
| 120uF/400V | C37 | C36*20-PH7.5 |
| 0.47uF/450V | C39 | C10.5X6-PH10 |
| 47uF/35V | C42 | CE5 |
| 470pF/25V | C43 | C0603 |
| 330pF/25V | C44 | C0603 |
| 0.1uF/25V | C45 | C0805 |
| 222M/250V Y1 | C46 | C15.5X6.5-PH12.5 |
| 100pF/50V | C47 | C0603 |
| 0.1uF/25V | C48 | C0603 |
| 0.47uF/300V | CX1 | C17X10-PH15 |
| SBR30V60CT | D1 | SD-TO220 |
| Green | D4 | LED3 |
| F7 | D6 | DC1206 |
| F7 | D8 | DC1206 |
| F7 | D9 | DC1206 |
| 1N4148 | D10 | DC1206 |
| F7 | D11 | DC1206 |
| Fuse/2A/250VAC | F2 | MST-PH5 |
| T POINT S | L | 125R25 |
| 1mH | L3 | L4-12X6 |
| 20uH | L6 | RC0805 |
| 10D471K | MOV1 | NTC-B |
| T POINT S | N | 125R25 |
| 5R | NTC1 | NTC-PH7.5 |
| 13N650V | Q3 | MOS-TO220A |

| | | |
|---|---|---|
| 100KΩ | R19 | RC1206 |
| 20KΩ | R20 | RC1206 |
| 10Ω | R21 | RC0603 |
| NC | R22 | RC0603 |
| 2.7Ω | R25 | RC1206 |
| 2.7Ω | R26 | RC1206 |
| 2.7Ω | R27 | RC1206 |
| 2.7Ω | R28 | RC1206 |
| 430KΩ | R29 | RC1206 |
| 91KΩ | R31 | RC0603 |
| 110KΩ | R32 | RC0603 |
| 22kΩ | R33 | RC0805 |
| 10KΩ | R34 | RC0603 |
| 100KΩ | R35 | RC0603 |
| 0Ω | R36 | RC1206 |
| 39KΩ | R37 | RC0603 |
| 24KΩ | R38 | RC0603 |
| 1KΩ | R40 | RC0603 |
| 10KΩ | R41 | RC0603 |
| 1KΩ | R51 | RC1206 |
| 200kΩ | R52 | RC0805 |
| T POINT S | SGND | 125R25 |
| EW15 | T3 | PQ-26X20 |
| 2mH | T4 | L4-12X6X4.5 |
| 15mH | T5 | L4-18.5X11.5X7.5 |
| AT6001 | U2 | SOP-10 |
| PC817B | U4 | PC123-P2.54 |
| TL431 | U6 | SMDQ-SOT23-KRA |
| T POINT S | VO | 125R25 |

# 12V/4A 樣機 變壓器資訊(三明治繞法)




12V , 4A: (48W ) PQ-2620

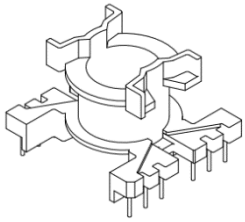
N1 : 20 圈, 漆包線線徑 0.45mm , PIN6 起繞, PIN5 結束。繞完之後，膠帶 1 層。

N2 : 4 圈,三層絕緣線,線徑 0.9mm *2 (外徑 1.1mm)兩條並繞, PIN12,11 起繞, PIN7,8 結束。繞完之後，膠帶 1 層。

N3 :26 圈, 漆包線線徑 0.45mm , PIN5 起繞, PIN4 結束。繞完之後，膠帶 1 層。

N4 : 4 圈 , 漆包線線徑 0.2mm , PIN2 起繞, PIN1 結束。繞完之後，膠帶 1 層。

| | | | |
|---|---|---|---|
| N4 | P2->P1 | Ø0.2 | 4Ts |
| N3 | P5->P4 | Ø0.45 | 26Ts |
| N2 | P11,12->P7,8 | Ø1.1*2 | 4Ts |
| N1 | P6->P5 | Ø0.45 | 20Ts |



注意事項 :

a, N1 繞滿 1 層 20 圈，繞法為 “均繞”。

b, N2 繞法為均繞，飛線出來，正端(弗龍)與負端(熱縮)，線留 50mm在外面。

c, N3 繞法為均繞，繞滿 1 層 20 圈,剩下 6 圈繞下一層，N1+N3 合計 46 圈。

d, N4 繞法為 “均繞”。

e, 未含浸 ,鐵心LP9 , GAP研磨

f, 一次側主線圈感量 1200uH ,