

PN8160T+PN8308L 12V2A

多模式（高低压分频+PFM+PWM+QR）

专利高压启动模块+低工作电流

超低待机功耗小于**60mW**

PN8160T DIP8封装，集成功率MOSFET

PN8308L SOP8封装，集成功率MOSFET

六级能效裕量充足



General Design Specification:

- 1 AC Input Range 90-264VAC
- 2 DC Output 12V/2A
- 3 Meet “75mW@12V” No-Load Standby Power Consumption Requirement
- 4 Meet “DOE LEVEL VI” Efficiency Requirement
- 5 Max Output Ripple & Noise < 100mV

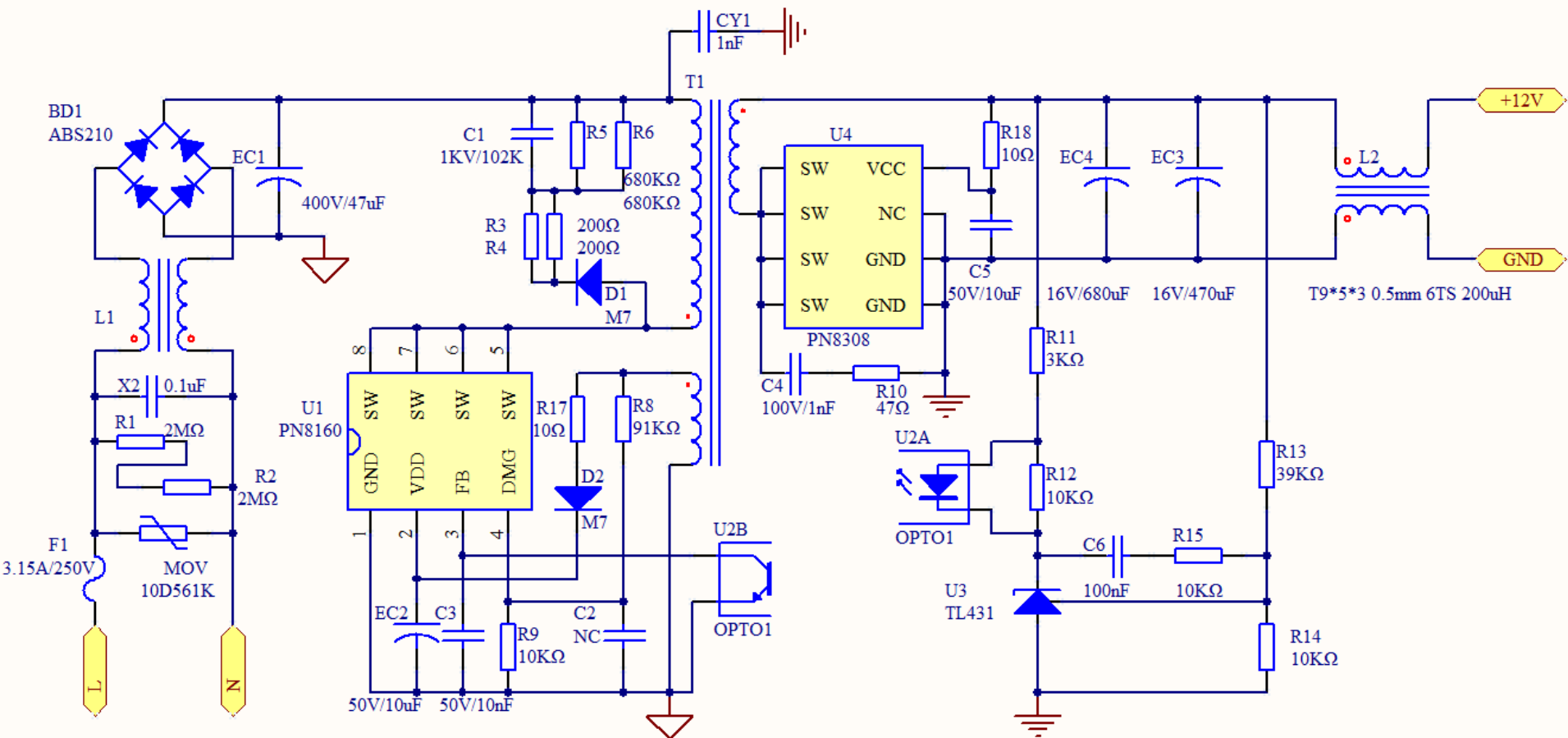
1、Specification

| Description | Symbol | Min | Typ | Max | Unit | Comment |
|---------------------------|-------------------------|---------|--------|-----|-------|---------|
| Input | | | | | | |
| Voltage | Vin | 90 | | 264 | V | |
| Frequency | Fs | 50 | | 60 | Hz | |
| No-Load Input Power(230V) | | | | 60 | mW | |
| Output | | | | | | |
| 12V/2A | Output Voltage | Vout | 11.87 | | 12.18 | V |
| | Output Current | Iout | 0 | | 2 | A |
| | Over Current Protection | Iocp | | | 3.04 | A |
| | Ripple & Noise | Vripple | | | 90 | mVp-p |
| | Average Efficiency | η | 88.33% | | | |
| Ambient Temperature | Tamb | 0 | | 40 | °C | |

Test condition:

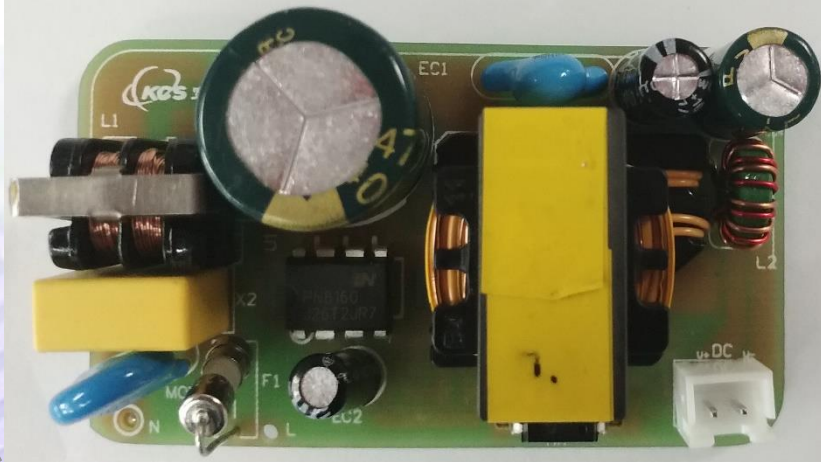
Test at the end of the line terminal(22AWG/1.5m)

2、Schematic

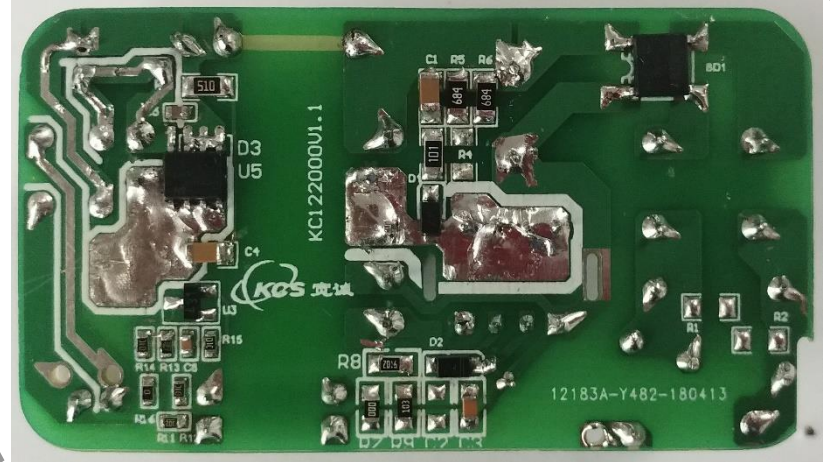


3、Circuit Board Photograph

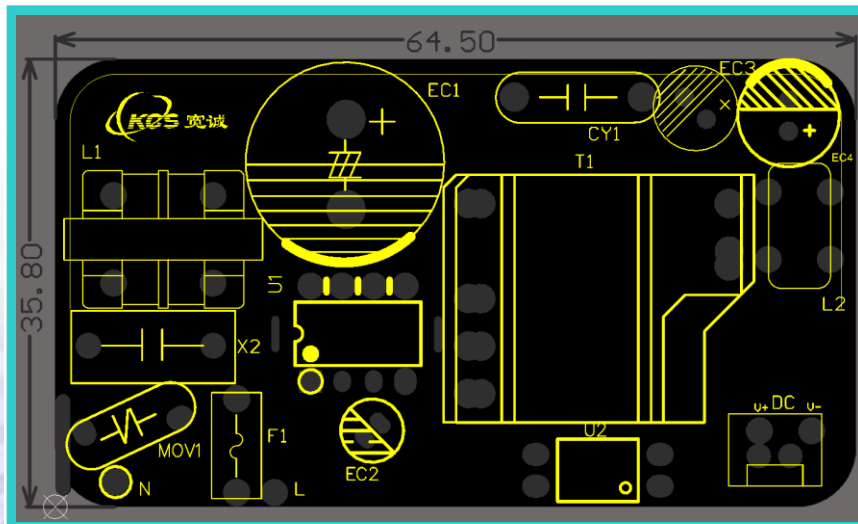
Top View



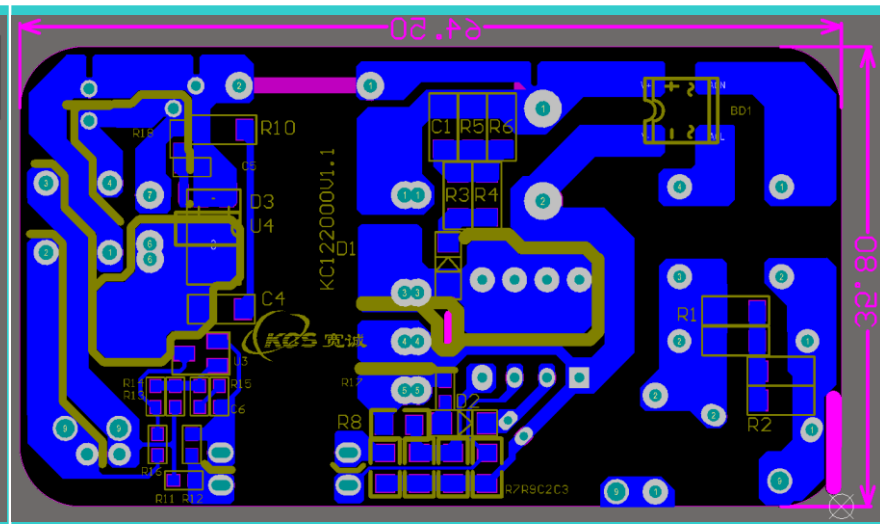
Bottom View



4、Layout



top layer



bottom layer

5.1、Bill of Material

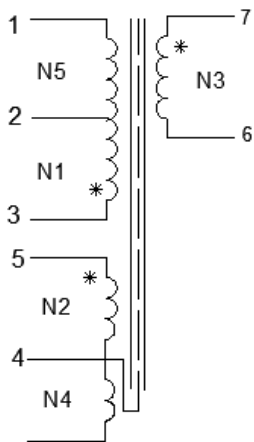
| 序号 | 元件标号 | 元件名称 | 原件型号 | 封装尺寸 | 数量 | 备注 |
|----|------|-------|-------------------------|---------------|----|----|
| 1 | BD1 | 整流桥 | ABS210 | SMD SOP4 | 1 | |
| 2 | C1 | 陶瓷电容 | 1nF/1KV | SMD 1206 | 1 | |
| 3 | C2 | | NC | SMD 0805 | | |
| 4 | C3 | | 10nF/50V 5% 0805 | SMD 0805 | 1 | |
| 5 | C4 | | 1nF/100V 5%1206 | SMD 1206 | 1 | |
| 6 | C5 | | 10uF/50V/0603 | SMD 0603 | 1 | |
| 7 | C6 | | 100nF/25V 0603 | SMD 0603 | 1 | |
| 8 | CY1 | Y安规电容 | 1nF P=10mm | DIP 脚距10.0mm | 1 | |
| 9 | D1 | 二极管 | M7 SOD-123 | SMD SOD-123FL | 1 | |
| 10 | D2 | | M7 SOD-123 | SMD SOD-123FL | 1 | |
| 11 | EC1 | 电解电容 | 电解电容47uF/400V φ13*20mm | Φ10*16mm | 1 | |
| 12 | EC2 | | 电解电容10uF/50V φ5.0*11mm | Φ5*11mm | 1 | |
| 13 | EC3 | | 电解电容470uF/16V φ6.3*12mm | Φ6.3*13mm | 1 | |
| 14 | EC4 | | 电解电容680uF/16V φ8.0*15mm | Φ8*16mm | 1 | |
| 15 | F1 | 保险丝 | 3.15A/250V φ3.6*10mm | 脚距7.5mm | 1 | |
| 16 | L1 | 电感 | UU9.8 30mH 0.2mm | DIP4 | 1 | |
| 17 | L2 | | T9*5*3 0.5mm 6TS 200uH | DIP4 | 1 | |
| 18 | MOV | 压敏电阻 | 10D561K P=7.8mm | 脚距7.8mm | 1 | |
| 19 | R1 | 电阻 | NC | SMD 1206 | | |
| 20 | R2 | | NC | SMD 1206 | | |
| 21 | R3 | | 200Ω 5% 1206 | SMD 1206 | 1 | |
| 22 | R4 | | 200Ω 5% 1206 | SMD 1206 | 1 | |
| 23 | R5 | | 680k 5% 1206 | SMD 1206 | 1 | |
| 24 | R6 | | 680k 5% 1206 | SMD 1206 | 1 | |
| 25 | R7 | | 0R 5% 0805 | SMD 0805 | 1 | |
| 26 | R8 | | 91K 5% 0805 | SMD1206 | 1 | |

5.2、Bill of Material

| 序号 | 元件标号 | 元件名称 | 原件型号 | 封装尺寸 | 数量 | 备注 |
|----|------|------|------------------------|-------------|----|---------------|
| 27 | R9 | | 10K 5% 0805 | SMD 0805 | 1 | |
| 28 | R10 | | 47Ω 5% 1206 | SMD 1206 | 1 | |
| 29 | R11 | | 3k 5% 0603 | SMD 0603 | 1 | |
| 30 | R12 | | 10k 5% 0603 | SMD 0603 | 1 | |
| 31 | R13 | | 39k 1% 0603 | SMD 0603 | 1 | 1% |
| 32 | R14 | | 10k 1% 0603 | SMD 0603 | 1 | 1% |
| 33 | R15 | | 10k 5% 0603 | SMD 0603 | 1 | |
| 34 | R16 | | 0R 5% 0603 | SMD 0603 | 1 | |
| 35 | R17 | | 10Ω 5% 0603 | SMD 0603 | 1 | |
| 36 | R18 | | 10Ω 5% 0603 | SMD 0603 | 1 | |
| 37 | T1 | 变压器 | EE22 立式加宽5+2 | EE22立式加宽5+5 | 1 | 刘生13148805055 |
| 38 | U1 | IC | PN8160T | DIP8 | 1 | |
| 39 | U2 | 光耦 | EL817 DIP4 | DIP4 | 1 | |
| 40 | U3 | 431 | TL431 SOT-23 | SOT-23 | 1 | |
| 41 | U4 | 同步整流 | PN8308L SOP8 | SOP8 | 1 | |
| 42 | X2 | X2电容 | X2 0.1uF 13*6mm P=10mm | P=10mm | 1 | |

6、Transformer Drawing

1.原理图



<<NOTE>>

1. N3绕组使用三层绝缘线.
2. 气隙研磨中柱.
3. 磁芯中柱可点黑胶固定
4. 磁芯接地

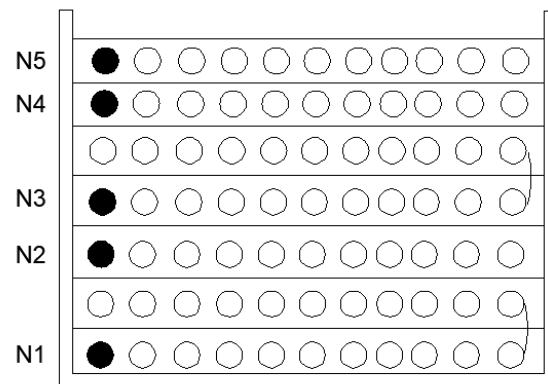
3.电气特性:

- 1.1 电感量:PIN 3- 1 1.8mH +/-5%; 测试条件: 1KHz 0.25V
- 1.2 漏感量:PIN 3- 1 120uH Max 测试条件: 10KHz 0.25V; PIN 8-7 5-4 短路.
- 1.3 高压测试:
 - 1.3.1 初级-次级 3750VAC 5mA 60S
 - 1.3.2 初、次级-磁芯 1500VAC 5mA 60S
- 1.4 绝缘电阻: 100Mohm Min; 测试条件: 500VDC

2.绕线结构

| 绕组 | 起末端 | 漆包线 | 圈数(TS) | 胶带圈数(TS) | 绕线方式 | 备注 |
|----|---------|---------------------------------|--------|----------|------|----|
| N1 | 3 -- 2 | 2UEW \varnothing 0.27mm X 1P | 57 | 2 | 平整密绕 | 两层 |
| N2 | 5 -- 4 | 2UEW \varnothing 0.17mm X 2P | 14 | 2 | 均匀疏绕 | 一层 |
| N3 | 7 -- 6 | TEX-B \varnothing 0.55mm X 2P | 10 | 2 | 平整密绕 | 一层 |
| N4 | 4 -- NC | 2UEW \varnothing 0.17mm X 1P | 37 | 2 | 平整密绕 | 一层 |
| N5 | 2 -- 1 | 2UEW \varnothing 0.27mm X 1P | 24 | 2 | 平整密绕 | 一层 |

4.绕线剖面示意图



BOBBIN

EE22加宽立式 $A_e=62\text{mm}^2$ 5+2pin PC40

7.1 Regulation, Ripple and Efficiency

| Vin (V) | Pin (W) | Iout (A) | Vout (V) | η (%) | Avg η (%) | OCP (A) | Vripple MAX (mV) | Doe Level VI Requirement |
|--------------|---------|----------|----------|------------|----------------|---------|------------------|--------------------------|
| 115Vac /60Hz | 0.04 | 0 | 12.18 | | | 3.04 | 79 | 86.20% |
| | 2.78 | 0.2 | 12.15 | 87.39% | | | | |
| | 6.76 | 0.5 | 12.10 | 89.48% | | | | |
| | 13.42 | 1 | 12.02 | 89.55% | 88.10% | | | |
| | 20.56 | 1.5 | 11.97 | 87.32% | | | | |
| | 27.66 | 2 | 11.90 | 86.03% | | | | |
| 230Vac /50Hz | 0.06 | 0 | 12.18 | | | | 3.09 | |
| | 2.88 | 0.2 | 12.15 | 84.36% | | | | |
| | 6.86 | 0.5 | 12.10 | 88.21% | | | | |
| | 13.47 | 1 | 12.02 | 89.27% | 88.55% | | | |
| | 20.07 | 1.5 | 11.95 | 89.29% | | | | |
| | 27.15 | 2 | 11.87 | 87.43% | | | | |

Test condition:

Test at the end of the line terminal(22AWG/1.5m)

传导测试



Anbotek Compliance Laboratory Limited

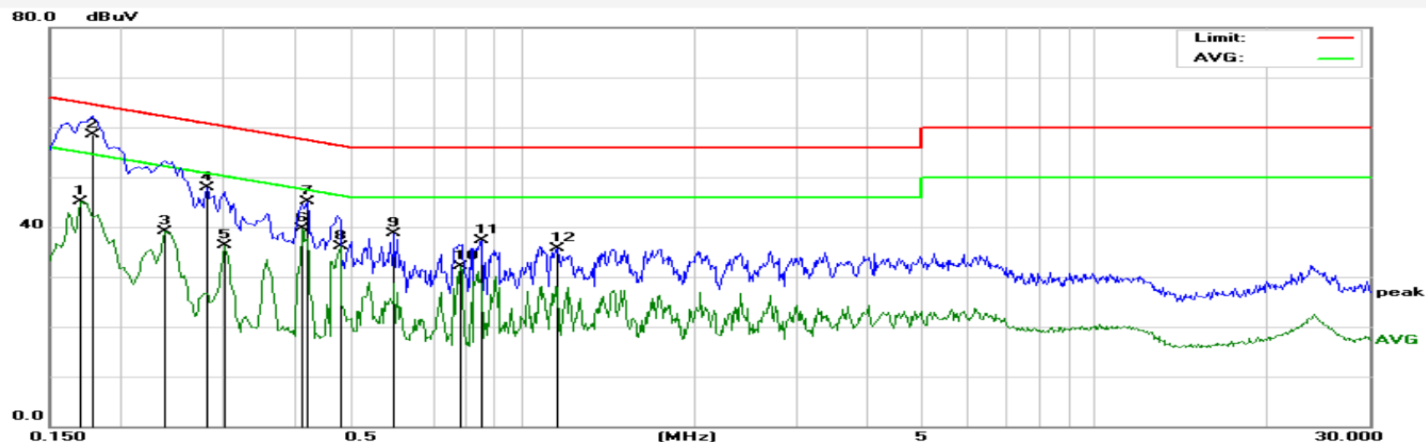
1/F, Building D, Sogood Science and Technology Park, Sanwei community,
Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. 518102

Tel: (86)755-26066365
Fax: (86)755-26014772

Job No.: SZAW180426002
Standard: EN55032 CE-Class B_QP
Test item: Conduction Test
Temp.(C)/Hum.(%) 23.4 / 57 %
EUT: Power Adapter
Mode: Charge Mode
Model: KC122000 CV1

Phase: L1
Power Source: AC 230V/50Hz
Date: 2018/05/23
Time: 21:44:21
Engineer Signature:

Note:



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1 | 0.1700 | 25.13 | 19.90 | 45.03 | 54.96 | -9.93 | AVG | |
| 2 | 0.1780 | 38.57 | 19.90 | 58.47 | 64.57 | -6.10 | QP | |
| 3 | 0.2380 | 19.12 | 19.89 | 39.01 | 52.16 | -13.15 | AVG | |
| 4 | 0.2819 | 27.92 | 19.89 | 47.81 | 60.76 | -12.95 | QP | |
| 5 | 0.3020 | 16.41 | 19.89 | 36.30 | 50.19 | -13.89 | AVG | |
| 6 | 0.4140 | 19.70 | 19.94 | 39.64 | 47.57 | -7.93 | AVG | |
| 7 | 0.4220 | 25.11 | 19.94 | 45.05 | 57.41 | -12.36 | QP | |
| 8 | 0.4820 | 16.07 | 19.97 | 36.04 | 46.30 | -10.26 | AVG | |
| 9 | 0.5980 | 18.65 | 20.01 | 38.66 | 56.00 | -17.34 | QP | |
| 10 | 0.7820 | 12.10 | 20.06 | 32.16 | 46.00 | -13.84 | AVG | |
| 11 | 0.8500 | 17.30 | 20.08 | 37.38 | 56.00 | -18.62 | QP | |
| 12 | 1.1539 | 15.54 | 20.12 | 35.66 | 56.00 | -20.34 | QP | |

传导测试



Anbotek Compliance Laboratory Limited

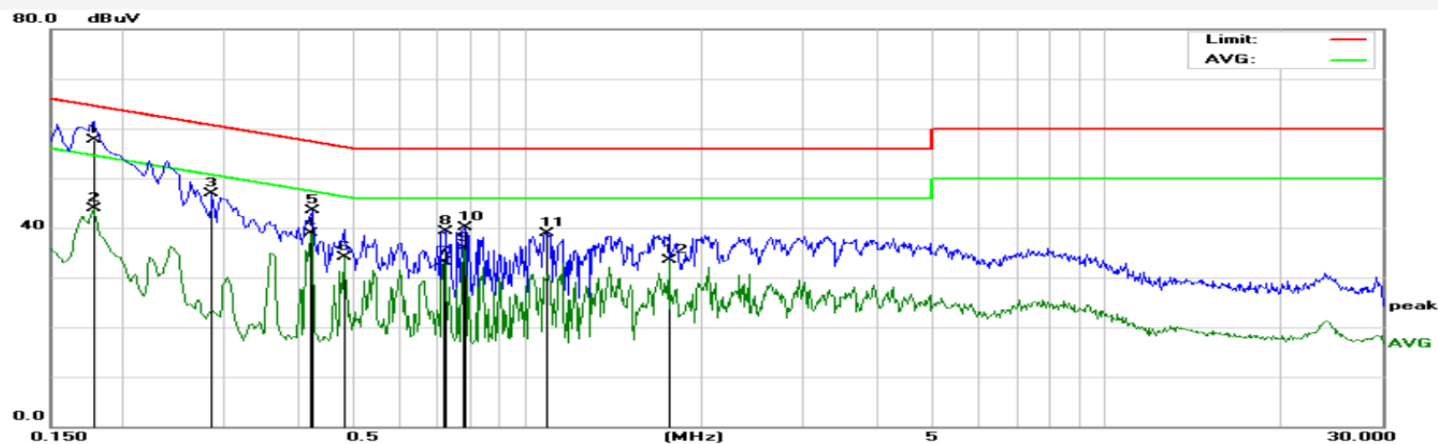
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Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. 518102

Tel: (86)755-26066365
Fax: (86)755-26014772

Job No.: SZAWW180426002
Standard: EN55032 CE-Class B_QP
Test item: Conduction Test
Temp.(C)/Hum.(%) 23.4 / 57 %
EUT: Power Adapter
Mode: Charge Mode
Model: KC122000 CV1

Phase: N
Power Source: AC 230V/50Hz
Date: 2018/05/23
Time: 21:46:14
Engineer Signature:

Note:



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|------------|-----------------|----------|--------|
| 1 | 0.1780 | 37.77 | 19.90 | 57.67 | 64.57 | -6.90 | QP | |
| 2 | 0.1780 | 24.06 | 19.90 | 43.96 | 54.57 | -10.61 | AVG | |
| 3 | 0.2860 | 27.08 | 19.89 | 46.97 | 60.64 | -13.67 | QP | |
| 4 | 0.4220 | 18.95 | 19.94 | 38.89 | 47.41 | -8.52 | AVG | |
| 5 | 0.4260 | 23.62 | 19.95 | 43.57 | 57.33 | -13.76 | QP | |
| 6 | 0.4820 | 14.12 | 19.97 | 34.09 | 46.30 | -12.21 | AVG | |
| 7 | 0.7180 | 12.97 | 20.04 | 33.01 | 46.00 | -12.99 | AVG | |
| 8 | 0.7220 | 19.32 | 20.05 | 39.37 | 56.00 | -16.63 | QP | |
| 9 | 0.7780 | 15.75 | 20.06 | 35.81 | 46.00 | -10.19 | AVG | |
| 10 | 0.7820 | 20.02 | 20.06 | 40.08 | 56.00 | -15.92 | QP | |
| 11 | 1.0859 | 18.87 | 20.12 | 38.99 | 56.00 | -17.01 | QP | |
| 12 | 1.7540 | 13.39 | 20.14 | 33.53 | 46.00 | -12.47 | AVG | |

辐射测试



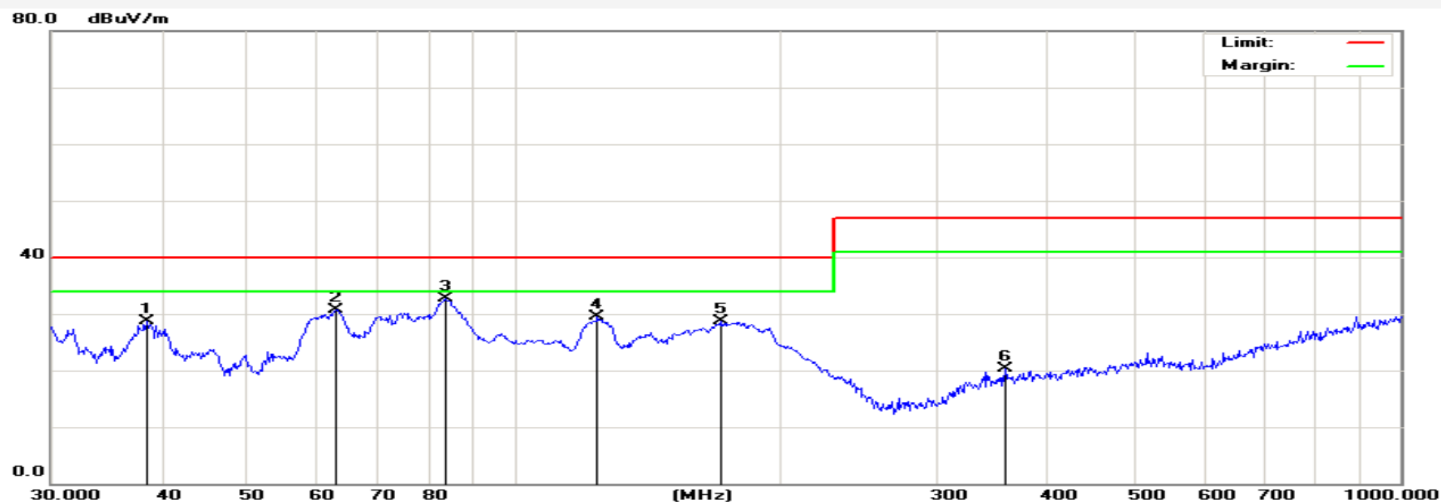
Anbotek Compliance Laboratory Limited
 1/F, Building D, Sogood Science and Technology Park, Sanwei comm-
 unity, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.

Site: 966 Chamber#2
 Tel: (86)755-26066365
 Fax: (86)755-26014772

Job No.: SZAWW180426002
 Standard: (RE)EN55032_class B_3m
 Test item: Radiation Test
 Temp.(C)/Hum.(%) 23.2 / 54 %
 EUT: Power Adapter
 Mode: full load
 Model: KC122000 CV1

Polarization: Vertical
 Power Source: AC 220V/50Hz
 Date: 2018/05/24
 Time: 0:21:50
 Engineer Signature:
 Distance: 3m

Note:



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1 | 38.4809 | 42.93 | -14.20 | 28.73 | 40.00 | -11.27 | peak | | | |
| 2 | 62.8708 | 47.77 | -17.07 | 30.70 | 40.00 | -9.30 | peak | | | |
| 3 | 83.5222 | 51.10 | -18.48 | 32.62 | 40.00 | -7.38 | peak | | | |
| 4 | 124.1330 | 45.46 | -15.95 | 29.51 | 40.00 | -10.49 | peak | | | |
| 5 | 170.7926 | 45.12 | -16.50 | 28.62 | 40.00 | -11.38 | peak | | | |
| 6 | 357.9287 | 33.09 | -12.73 | 20.36 | 47.00 | -26.64 | peak | | | |

辐射测试



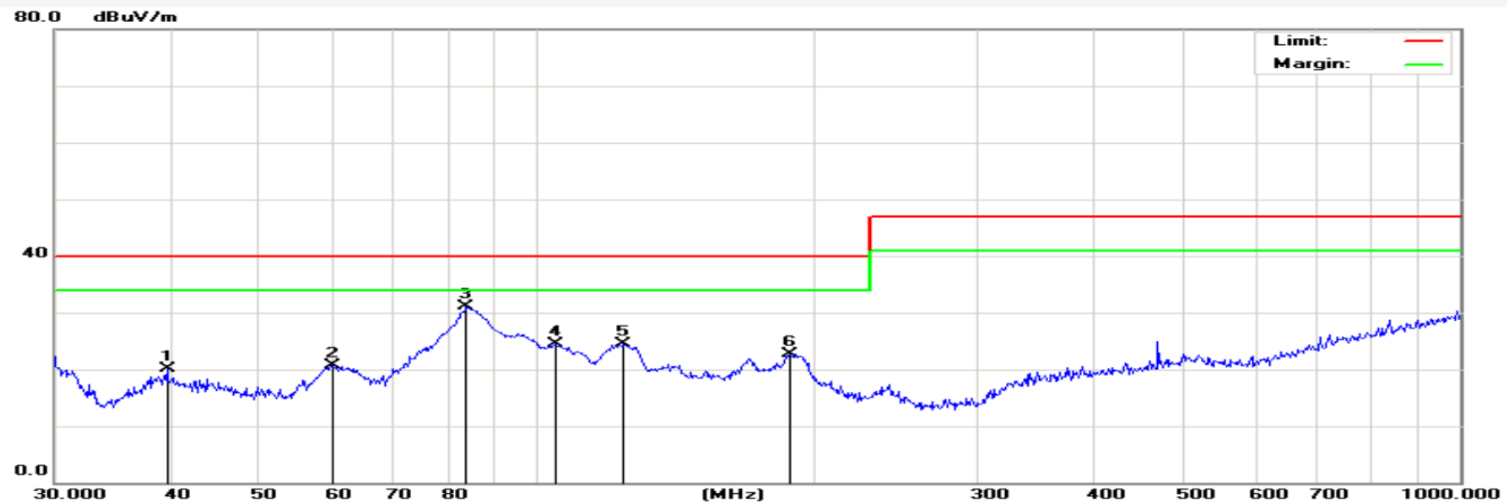
Anbotek Compliance Laboratory Limited
 1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.

Site: 966 Chamber#2
 Tel: (86)755-26066365
 Fax: (86)755-26014772

Job No.: SZAWW180426002
 Standard: (RE)EN55032_class B_3m
 Test item: Radiation Test
 Temp.(C)/Hum.(%) 23.2 / 54 %
 EUT: Power Adapter
 Mode: full load
 Model: KC122000 CV1

Polarization: Horizontal
 Power Source: AC 220V/50Hz
 Date: 2018/05/24
 Time: 0:20:29
 Engineer Signature:
 Distance: 3m

Note:



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|-----|-------------|------------------|---------------|-----------------|---------------|-----------------|----------|-------------|--------------|--------|
| 1 | 39.7146 | 34.63 | -14.52 | 20.11 | 40.00 | -19.89 | peak | | | |
| 2 | 60.0691 | 37.80 | -17.03 | 20.77 | 40.00 | -19.23 | peak | | | |
| 3 | 83.8156 | 52.45 | -21.38 | 31.07 | 40.00 | -8.93 | peak | | | |
| 4 | 104.5361 | 45.18 | -20.69 | 24.49 | 40.00 | -15.51 | peak | | | |
| 5 | 124.1330 | 45.92 | -21.50 | 24.42 | 40.00 | -15.58 | peak | | | |
| 6 | 187.7530 | 42.62 | -19.91 | 22.71 | 40.00 | -17.29 | peak | | | |



Thank you

深圳市宽诚集成电路技术有限公司

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