深圳市旭茂微电子有限公司
Shenzhen Xumao Microelectronics Co., LTD

# XM10NP04S

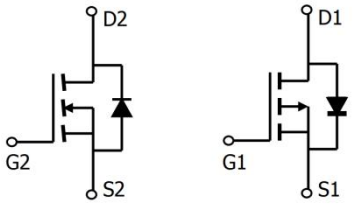
## 用途 APPLICATIONS

- 负载开关 Load Switch
- PWM 应用 PWM Application
- 不间断电源 Uninterruptible power supply

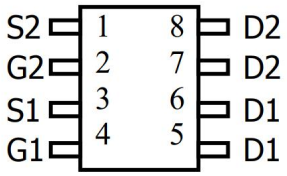
## 特点 FEATURES

- 高级沟槽技术 Advanced Trench Technology
- 优异的导通电阻(RDS(ON))和低门极电荷 Excellent RDS(ON) and Low Qg
- RoHS 产品 RoHS product
- 产品全部经过雪崩测试 100% avalanche tested

封装 Package




n-channel p-channel




SOP-8

XM10NP04S

## 主要参数 MAIN CHARACTERISTICS

| | Rdson-typ (@Vgs=10V) | VDSS | ID | Qg-typ | EAS |
|---|---|---|---|---|---|
| N-Channel | 19mΩ | 40V | 10A | 13nC | 31mJ |
| P-Channel | 32mΩ | -40V | -9A | 22nC | 38mJ |

## 订货信息 ORDER MESSAGE

| 订货型号 Order codes | | | 包装方式 Package | 包装数量 SPQ(Pcs) |
|---|---|---|---|---|
| 印记 Marking | 封装形式 Package form | 无卤素 Halogen Free | | |
| XM10NP04S | SOP-8 | YES | 编带 | 3000 |

## 绝对最大额定值 ABSOLUTE RATINGS (Tc=25℃)

| 参数名称 Parameter name | 符号 Symbol | 型号 | | 单位 Value |
|---|---|---|---|---|
| | | XM10NP04S | | |
| | | N-Channel | P-Channel | |
| 最高漏极—源极直流电压 Drain-Source Voltage | VDSS | 40 | -40 | V |
| 连续漏极电流 Drain Current-continuous | ID Tc=25℃ | 10 | -9 | A |
| | ID Tc=100℃ | 6 | -5 | |
| 最大脉冲漏极电流（注1） Drain Current - pulse (note 1) | $I_{DM}$ | 28 | -25 | A |
| 最高栅源电压 Gate-Source Voltage | $V_{GSS}$ | ±20 | ±20 | V |
| 单脉冲雪崩能量（注2） SinglePulsedAvalanche Energy (note 2) | $E_{AS}$ | 31 | 38 | mJ |
| 雪崩电流（注 2） Avalanche Current (note 2) | $I_{AR}$ | 10 | -9 | A |
| 耗散功率 Power Dissipation | $P_D$ $T_C$=25℃ | 2.6 | 2.2 | W |
| | | 0.65 | 0.65 | W/℃ |
| 最高结温及存储温度 Operating and Storage Temperature Range | TJ, TSTG | -55 ～ 150 | | ℃ |
| 最高焊接温度 Maximum welding temperature | $T_L$ | 300 | | ℃ |

## 热特性 THERMAL CHARACTERISTIC

| 参数名称 Parameter name | 符号 Symbol | 型号 XM10NP04S | 单位 Unit |
|---|---|---|---|
| 结到管壳的热阻 Thermal Resistance, Junction to Case | Rth(j-c) | 30 | ℃/W |
| 结到环境的热阻 Thermal Resistance, Junction to Ambient | Rth(j-A) | 65 | ℃/W |

## N-Channel
## 关态特性 Off -Characteristics

| 参数名称 Parameter name | 符 号 Symbol | 测试条件 Tests conditions | 最小 Min | 典型 Typ | 最 大 Max | 单位 Units |
|---|---|---|---|---|---|---|
| 漏一源击穿电压 Drain-Source Voltage | $BV_{DSS}$ | ID=250μA, VGS=0V | 40 | - | - | V |
| 击穿电压温度特性 Breakdown. Voltage Temperature. Coefficient | $\Delta BV_{DSS}/\Delta T_J$ | ID=250μA, referenced to 25℃ | - | 0.05 | - | V/℃ |
| 零栅压下漏极漏电流 Zero Gate Voltage Drain Current | $I_{DSS}$ | VDS=40V, VGS =0V | - | - | 1 | uA |
| 反向栅极体漏电流 Gate-body leakage current | $I_{GSS}$ | VDS=0V, VGS =±20V | - | - | ±100 | nA |

| | | | | | | |
|---|---|---|---|---|---|---|
| 阈值电压 Gate Threshold Voltage | $V_{GS(th)}$ | VDS = VGS , ID=250μA | 1.2 | 1.7 | 2.5 | V |
| 静态导通电阻 Static Drain-Source On-ResistanceStatic Drain-Source | $R_{DS(ON)}$ | $V_{GS}$ =10V , $I_D$=5A | - | 19 | 23 | mΩ |
| | | $V_{GS}$ =4.5V , $I_D$=5A | - | 22 | 28 | mΩ |
| 正向跨导 Forward Transconductance | gfs | $V_{DS}$ = 5V, $I_D$=5A (note 4) | - | 16 | - | S |

| | | | | | | |
|---|---|---|---|---|---|---|
| 输入电容 Input capacitance | Ciss | VDS=15V, VGS =0V, f=1.0MHZ | - | 610 | - | pF |
| 输出电容 Output capacitance | Coss | | - | 88 | - | pF |
| 反向传输电容 Reverse transfer capacitance | Crss | | - | 52 | - | pF |
| 栅极电阻 Gate resistance | Rg | VDS=0V , VGS=0V , f=1MHz | - | 1.8 | - | Ω |

## N-Channel
## 开关特性 Switching Characteristics

| 参数名称 Parameter name | 符 号 Symbol | 测试条件 Tests conditions | 最小 Min | 典型 Typ | 最 大 Max | 单位 Units |
|---|---|---|---|---|---|---|
| 延迟时间 Turn-On delay time | td(on) | $V_{DD}$=15V, ID=5A, RG=20Ω (note 4, 5) | - | 9 | - | ns |
| 上升时间 Turn-On rise time | tr | | - | 5 | - | ns |
| 延迟时间 Turn-Off delay time | td(off) | | - | 26 | - | ns |
| 下降时间 Turn-Off Fall time | tf | | - | 13 | - | ns |
| 栅极电荷总量 Total Gate Charge | Qg | VDS =20V , ID=5A VGS =10V (note 4, 5) | - | 13 | - | nC |
| 栅—源电荷 Gate-Source charge | Qgs | | - | 5.6 | - | nC |
| 栅—漏电荷 Gate-Drain charge | Qgd | | - | 4 | - | nC |

## N-Channel
## 漏—源二极管特性及最大额定值
## Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|---|---|---|---|---|---|---|
| 正向最大连续电流 Maximum Continuous Drain -Source Diode Forward Current | I | $I_S$ | - | - | 10 | A |
| 正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current | I | $I_{SM}$ | - | - | 28 | A |
| 正向压降 Drain-Source Diode Forward Voltage | $V_{SD}$ | VGS=0V, IS=5A | - | - | 1.2 | V |
| 反向恢复时间 Reverse recovery time | $t_{rr}$ | TJ = 25°C, If = 5A $dI_F/dt$=100A/μs (note 4) | - | 30 | - | ns |
| 反向恢复电荷 Reverse recovery charge | $Q_{rr}$ | TJ = 25°C, IF = 5A $dI_F/dt$=100A/μs (note 4) | - | 9.5 | - | nC |

**注释：**

1：脉冲宽度由最高结温限制

2：L=0.1mH, VG=10V, VDD=20V, RG=25Ω，起始结温 TJ=25°C

3：ISD ≤5A, di/dt ≤300A/μs, VDD≤BVDSS, 起始结温 TJ=25°C

4：脉冲测试：脉冲宽度≤300μs, 占空比≤2%

5：基本与工作温度无关。

**Notes:**

1 : Pulse width limited by maximum junction temperature

2: L=0.1mH, VG=10V, VDD=20V, RG=25Ω, Starting TJ=25°C

3 : ISD ≤5A, di/dt ≤300A/μs, VDD≤BVDSS, Starting TJ=25°C

4: Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%

5: Essentially independent of operating temperature.

## P-Channel
## 关态特性 Off -Characteristics

| 参数名称 Parameter name | 符 号 Symbol | 测试条件 Tests conditions | 最小 Min | 典型 Typ | 最 大 Max | 单位 Units |
|---|---|---|---|---|---|---|
| 漏一源击穿电压 Drain-Source Voltage | $BV_{DSS}$ | ID=-250μA, VGS=0V | -40 | - | - | V |
| 击穿电压温度特性 Breakdown. Voltage Temperature. Coefficient | $\Delta BV_{DSS}/\Delta T_J$ | ID=-250uA, referenced to 25℃ | - | 0.05 | - | V/℃ |
| 零栅压下漏极漏电流 Zero Gate Voltage Drain Current | $I_{DSS}$ | VDS=-40V, VGS =0V | - | - | -1 | uA |
| 反向栅极体漏电流 Gate-body leakage current | $I_{GSS}$ | VDS=0V, VGS =±20V | - | - | ±100 | nA |

| | | | | | | |
|---|---|---|---|---|---|---|
| 阈值电压 Gate Threshold Voltage | $V_{GS(th)}$ | VDS = VGS , ID=-250μA | -1.2 | -1.6 | -2.5 | V |
| 静态导通电阻 Static Drain-Source On-ResistanceStatic Drain-Source | $R_{DS(ON)}$ | $V_{GS}$ =-10V , $I_D$=-5A | - | 32 | 38 | mΩ |
| | | $V_{GS}$ =-4.5V , $I_D$=-3A | - | 39 | 48 | mΩ |
| 正向跨导 Forward Transconductance | gfs | $V_{DS}$ = -5V, $I_D$=-5A (note 4) | - | 12 | - | S |

| | | | | | | |
|---|---|---|---|---|---|---|
| 输入电容 Input capacitance | Ciss | VDS=-15V, VGS =0V, f=1.0MHZ | - | 1350 | - | pF |
| 输出电容 Output capacitance | Coss | | - | 132 | - | pF |
| 反向传输电容 Reverse transfer capacitance | Crss | | - | 105 | - | pF |
| 栅极电阻 Gate resistance | Rg | VDS=0V , VGS=0V , f=1MHz | - | 1.5 | - | Ω |

## P-Channel
## 开关特性 Switching Characteristics

| 参数名称 Parameter name | 符 号 Symbol | 测试条件 Tests conditions | 最小 Min | 典型 Typ | 最 大 Max | 单位 Units |
|---|---|---|---|---|---|---|
| 延迟时间 Turn-On delay time | td(on) | $V_{DD}$=-15V, ID=-5A, RG=-10Ω (note 4, 5) | - | 20 | - | ns |
| 上升时间 Turn-On rise time | tr | | - | 15 | - | ns |
| 延迟时间 Turn-Off delay time | td(off) | | - | 53 | - | ns |
| 下降时间 Turn-Off Fall time | tf | | - | 10 | - | ns |
| 栅极电荷总量 Total Gate Charge | Qg | VDS =-20V , ID=-5A VGS =-10V (note 4, 5) | - | 22 | - | nC |
| 栅一源电荷 Gate-Source charge | Qgs | | - | 6.5 | - | nC |
| 栅一漏电荷 Gate-Drain charge | Qgd | | - | 3.3 | - | nC |

## P-Channel
## 漏一源二极管特性及最大额定值
## Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|---|---|---|---|---|---|---|
| 正向最大连续电流 Maximum Continuous Drain -Source Diode Forward Current | I | $I_S$ | - | - | -9 | A |
| 正向最大脉冲电流 Maximum Pulsed Drain-Source Diode Forward Current | I | $I_{SM}$ | - | - | -25 | A |
| 正向压降 Drain-Source Diode Forward Voltage | $V_{SD}$ | VGS=0V, IS=-5A | - | - | -1.2 | V |
| 反向恢复时间 Reverse recovery time | $t_{rr}$ | TJ = 25°C, If = -5A $dI_F/dt$=100A/μs (note 4) | - | 48 | - | ns |
| 反向恢复电荷 Reverse recovery charge | $Q_{rr}$ | TJ = 25°C, IF = -5A $dI_F/dt$=100A/μs (note 4) | - | 7.6 | - | nC |

**注释：**

1：脉冲宽度由最高结温限制

2：L=0.1mH, VGS=-10V, VDD=-20V,RG=25Ω，起始结温TJ=25°C

3：ISD ≤-4A,di/dt ≤300A/μs,VDD≤BVDSS,起始结温TJ=25°C

4：脉冲测试：脉冲宽度≤300μs,占空比≤2%

5：基本与工作温度无关。

**Notes:**

1： Pulse width limited by maximum junction temperature

2: L=0.1mH, VGS=-10V, VDD=-20V, RG=25Ω,Starting TJ=25°C

3： ISD ≤-4A,di/dt ≤300A/μs,VDD≤BVDSS, Starting TJ=25°C

4: Pulse Test: Pulse Width ≤300μs,Duty Cycle≤2%

5: Essentially independent of operating temperature.

# N-Channel

## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

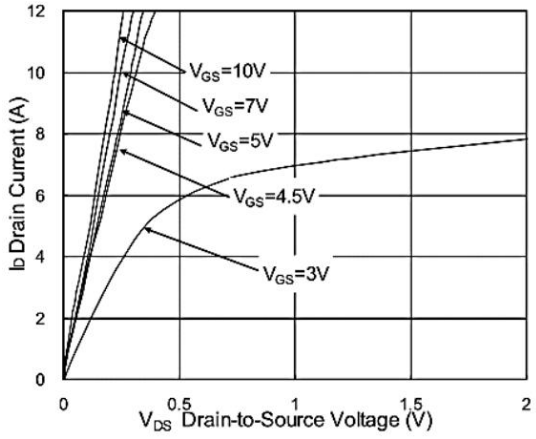



Figure 1: Output Characteristics

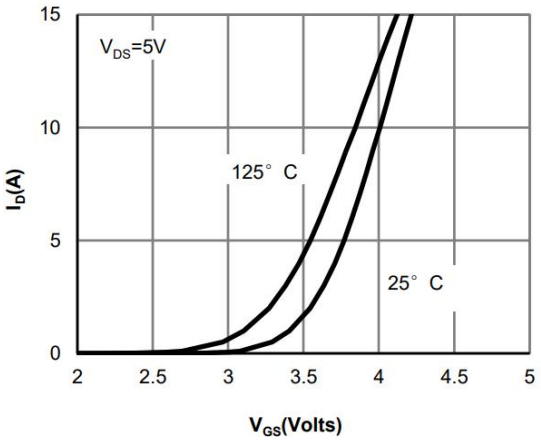



Figure 2: On-ResistanceStatic VS Vgs

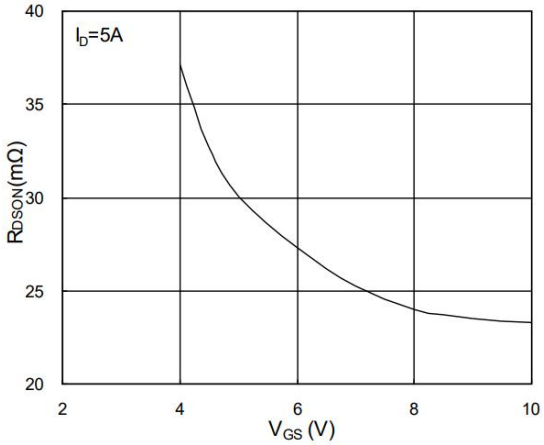



Figure 3: Rdson-Drain Current

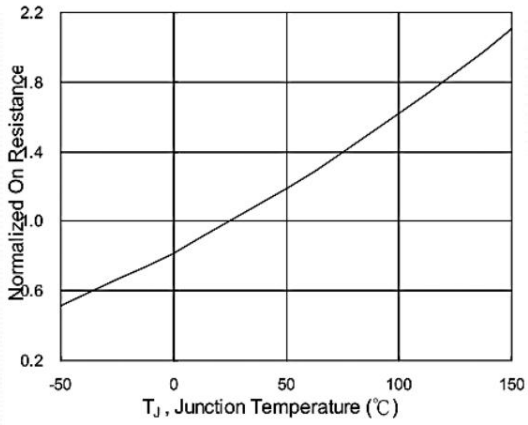



Figure 4: Rdson-JunctionTemperature

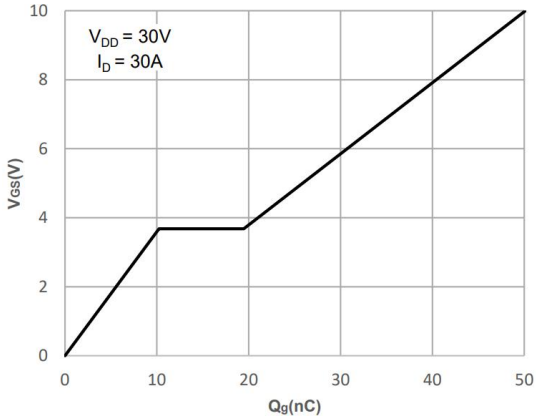



Figure 5: Gate Charge

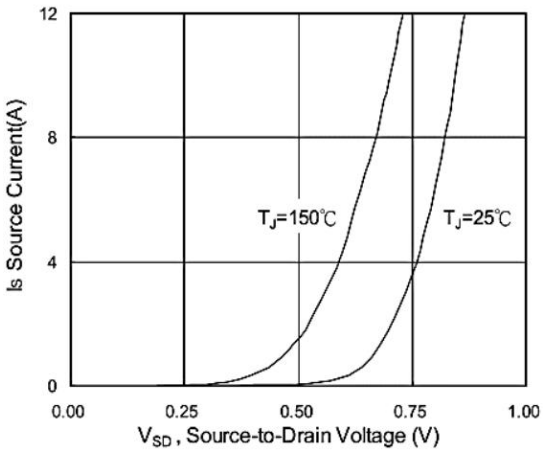



Figure 6: Source- Drain Diode Forward

# N-Channel

## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

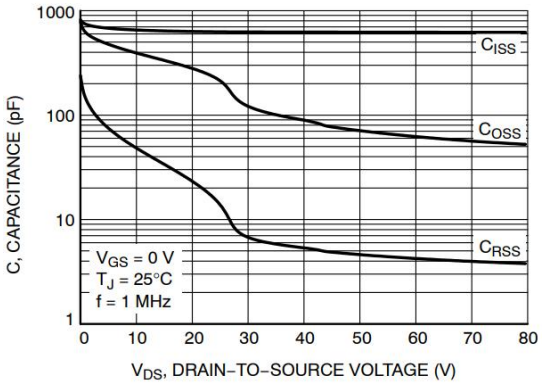



Figure 7: Capacitance vs Vds

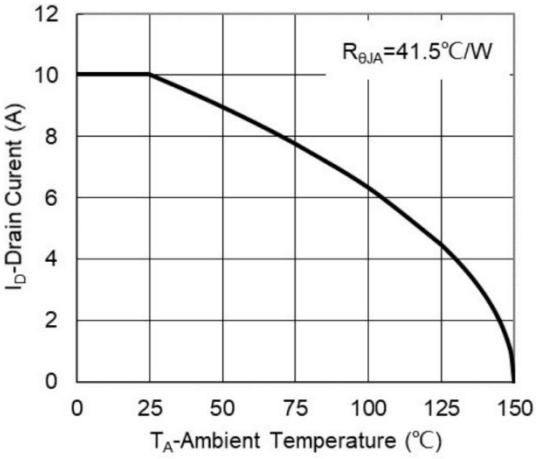



Figure 8: ID Current- Junction Temperature

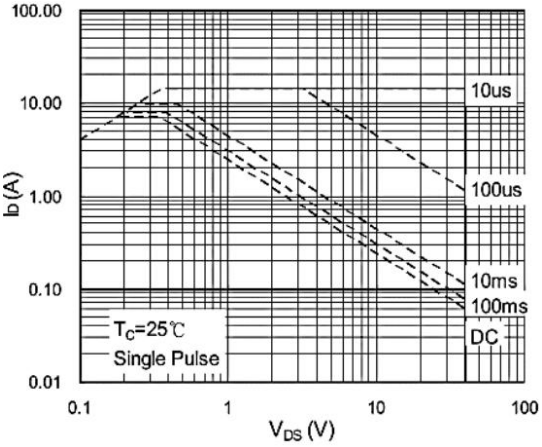
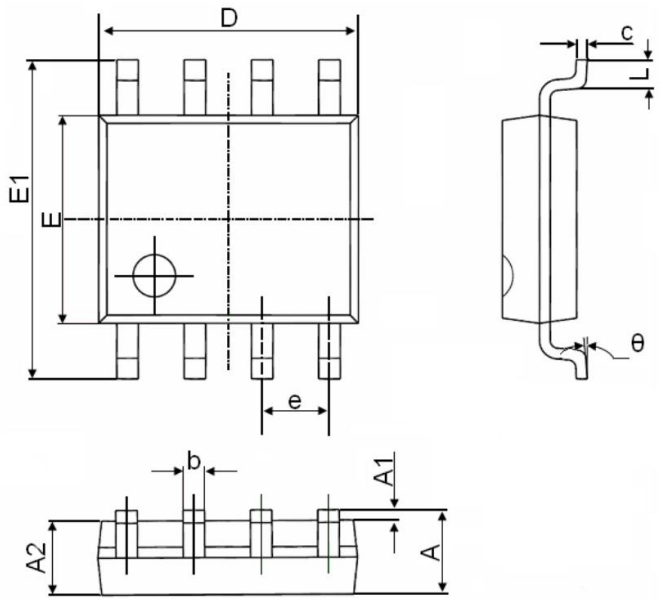



Figure 9: Safe Operation Area

# 外形尺寸 PACKAGE MECHANICAL DATA

SOP-8

单位 Unit：mm




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

# 版本更新 Version updates

| 版本号<br>Edition | 时间<br>Date | 更新记录 |
|---|---|---|
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# 重要注意事项

1.深圳市旭茂微电子有限公司保留说明书的更改权，恕不另行通知。客户在下单前应获取我司最新版本资料，并验证相关信息是否最新和完整。

2.我司产品属于消费类和/或民用类电子产品。

3.在应用我司产品时请不要超过产品的最大额定值，否则会影响整机的可靠性。任何半导体产品特定条件下都有一定的失效或发生故障的可能，买方有责任在使用我司产品进行系统设计、试样和整机制造时遵守安全标准并采取安全措施，以避免潜在失败风险可能造成人身伤害或财产损失情况的发生。

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# 联系方式

| | |
|---|---|
| 公司名称： | 深圳市旭茂微电子科技有限公司 |
| corporate name： | Shenzhen Xumao Microelectronics Co., Ltd |
| 公司地址： | 深圳市龙岗区坂田街道环城南路 15 号恒大都会广场 1 栋 405 室 |
| Company address： | Room 405, Building 1, Hengdu Metropolis Plaza, No. 15 Huancheng South Road, Bantian Street, Longgang District, Shenzhen |
| 生产商： | 四川旭茂微电子有限公司 |
| Manufacturer： | Sichuan Xumao Micro Technology Co., Ltd |
| 生产商地址： | 四川省遂宁市射洪县经济开发区河东大道 |
| Manufacturer address： | Hedong Avenue, Economic Development Zone, Shehong County, Suining City, Sichuan Province |
| 杭州办事处： | 浙江省杭州市余杭区博园路 1 号杭州电子市场西区 3E136 |
| Hangzhou Office： | 3E136, West Zone, Hangzhou Electronic Market, No.1 Boyuan Road, Yuhang District, Hangzhou City, Zhejiang Province |
| 中山办事处： | 广东省中山市古镇镇曹二文化路一街 6 巷 2 号 1 楼 |
| Hangzhou Office： | 1st Floor, No. 2, Lane 6, Cao'er Culture Road, Guzhen Town, Zhongshan City, Guangdong Province |
| 广州办事处： | 广东省广州市增城区宁西街香山大道 42 号雄兴孵化 1 栋 1305 |
| Hangzhou Office： | Room 1305, Building 1, Xiongxing Incubation, No. 42 Xiangshan Avenue, Ningxi Street, Zengcheng District, Guangzhou City, Guangdong Province |