1. 产品描述 PRODUCT DESCRIPTION

LSPMC0x-AALF06-xxCxxx系列是灵科传感推出的经过校准过的绝压传感器系列产品。该系列产品采用信号调理芯片对MEMS芯体输出进行校准和补偿，使得产品可以在全温区范围内输出高精度的压力信号。另外产品采用LGA封装，封装尺寸与引脚定义与国外同类型产品可以做到全替换，大大方便了客户端的应用。产品符合AEC-Q100车规级认证标准。

The LSPMC0x-AALF06-xxCxxx series is calibrated absolute pressure sensors developed by LINKSensing. This products calibrate and make compensation to the MEMS chips by using ASIC, then getting the pressure signal with high accuracy in the whole temperature range. In addition, the product adopts LGA package, both the package size and pin definition can be completely replaced with the same type of foreign products, which greatly facilitates the application of the client. The products comply with AEC-Q100 certification standards.

1.1 特点 / Feature

- 模拟电压比例输出，输出可定制
  Ratio metric analog output, output curve can be customized
- 高精度输出（3%FS@-40°C~130°C）
  High precision pressure sensing(3%FS@-40°C~130°C)
- 输出钳位，报警输出功能
  Clamping and output diagnose

1.2 应用领域 / Application

- 油箱蒸汽压力传感器
  Evaporative Emission Pressure Sensor
- 真空助力传感器
  Vacuum Booster Sensor
- 工业真空度监测
  Industrial Vacuum Detection
- 碳罐脱附压力传感器
  Purging Line Pressure Sensor
- 座椅靠背气囊
  Seat Air-bag Pressure Sensor
- 洗衣机液位检测
  Washing Machine Liquid Level Detection

2. 功能描述 FUNCTIONAL DESCRIPTION

LSPMC0x-AALF06-xxCxxx系列产品是通过 MEMS 压阻绝压压力芯体作为压力敏感元件，该元件会输出一个与环境压力呈正比例关系的一个原始信号输出。内置的调理芯片驱动该敏感元件，并对其原始信号进行放大、温度补偿、线性度补偿后输出一个与施加压力呈线性关系的电压信号。

The product uses a MEMS piezoresistive absolute chip as sensitive element, which outputs an original signal proportional to the ambient pressure. The sensor is driven by ASIC, and the original signal is amplified, temperature and linearity compensated, then output a voltage signal in a linear relationship with the applied pressure.

2.1 引脚定义图 / Pin Configuration

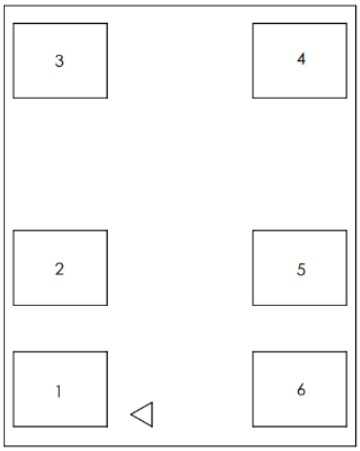


图2.1 引脚定义图

Figuree 2.1 Pin configuration diagram

2.2 引脚描述 / Pin Description

引脚 Pin	名称 Description	功能 Function
1	AOUT	模拟输出 Output
2	VDD	供电电源 Voltage Drain Drain
3	GND	地 Ground
4	GND	地 Ground
5	NC	保留引脚 Not Connected
6	NC	保留引脚 Not Connected

表2.1引脚定义表

Table 2.1 Pin configuration table

2.3 功能框图 / Block Diagram

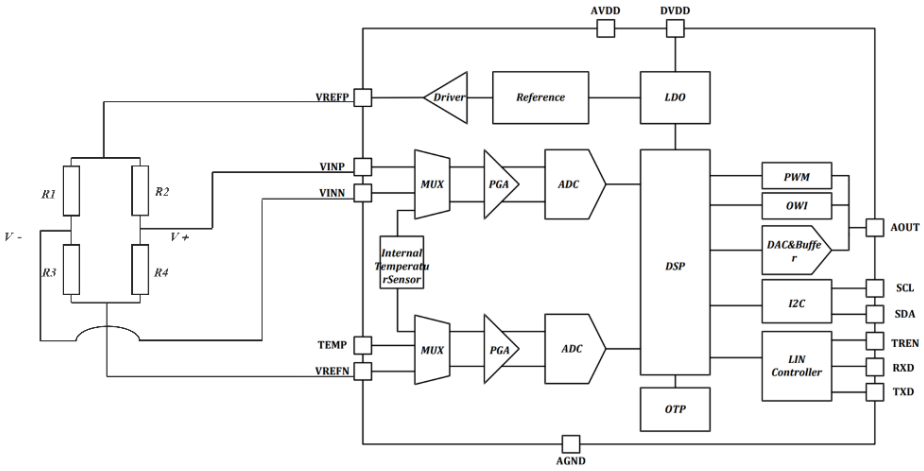


图2.2 功能框图

Figure 2.2 Functional block diagram

2.4 传递函数 / Transfer Function

$$V_{OUT} = (A \times P + B) \times V_{DD}$$

注/Note：

- P 为压力值，绝对压力，范围：PL~PH kPa A；上述传递函数仅在压力范围内成立。
  P is absolute pressure value, range from PL to PH kPa; the transfer function is workable only in the pressure range.
- VDD 仅在工作电压范围内满足上式；详见第三部分规格参数。
  VDD is workable only in the range of working voltage, details can be found on section 3 specifications.
- 典型产品的传递函数参考下表:
  Typical transfer function can be found on next table:

产品料号/PN	压力量程（kPaA） Pressure range（kPaA）		输出电压（V） output voltage(V)		传递函数系数 Coefficient of transfer curve	
	PL	PH	OL	OH	A	B
LSPMC04-AALF06-01C	10	115	0.4	4.65	0.0081	-0.00095
LSPMC06-AALF06-01C	10	300	0.5	4.5	0.00276	0.0724
LSPMC07-AALF06-01C	10	700	0.5	4.5	0.00116	0.0884
LSPMC0X-AALF06-xxCxxx	可定制 Customizable	可定制 Customizable	可定制 Customizable	可定制 Customizable	/	/

表2.2 产品对应传递函数表

Table 2.2 Product transfer function table

2.5 输出精度 / Output Accuracy

LSPMC0x-AALF06-xxCxxx系列产品的输出精度的影响因素包括供电电压（比例输出误差）、压力、温度以及老化因素。标准输出 指代的是在量程范围内的压力通过传递函数计算出来的理论电压输出。误差是实际测量电压值与电压值之间的差值。以下分析中的精度误差为典型应用电路中的精度误差。

The accuracy of the LSPMC0x-AALF06-xxCxxx series is influenced by the supply voltage(ratiometric error),as well as by pressure, temperature and aging effects. The specified value, calculated with the transfer function, represents the theoretical value. The error equals the deviation between the measured output voltage value and the specified output voltage value.

2.5.1 比例输出误差 / Ratiometric Error

理想情况下，产品是比例输出的。传感器的输出（VOUT）会跟随供电电压（VDD）进行等比例 的增大或减小。比例输出误差表示供电电压为 VDD 时的实际输出与理论输出之间的差值与典型供电电压的比值。其计算公式如下：

Ideally the sensor is ratiometric. the output (VOUT) scales by the same ratio that VDD increases or decreases. The ratiometric error is defined as the difference between the ratio that VDD changed and the ratio that VOUT changed, expressed as a percentage, the function is shown as below:

$$E_{RAT}(\%)=\frac{V_{OUT}(@V_{DD})-V_{OUT}(@5V)\times\frac{V_{DD}}{5V}}{5V}\times 100\%$$

当且仅当VDD 范围在表 3.2 中的工作电压范围内时，输出电压VOUT 才能保持与供电电压 VDD呈比例关系。

The output voltage VOUT is ratiometric to VDD. VDD must be in the operating range provided in table2.3.

供电电压（V） Supply Voltage（V）	最大比例输出误差（ERAT（%）@VDD，TYP） Max ratiometric error（ERAT（%）@VDD，TYP）
VDD,MIN	±0.5%
VDD,TYP	0
VDD,MAX	±0.5%

表2.3 比例输出误差表

Table 2.3 Ratiometric error table

2.5.2 综合精度误差 / Overall Accuracy

- P 为压力值，绝对压力，范围：PL~PH kPa A；上述传递函数仅在压力范围内成立。
  Overall accuracy covers the entire pressure and temperature range from different sources of error including the following.
- 压力：在指定压力范围内，压力实际输出值与理论输出值之间的误差。
  Pressure：Output deviation from target transfer function over the specified pressure range.
- 温度：全工作温区内，由温度补偿途径引入的误差。
  Temperature：Output deviation over the temperature range.
- 老化：产品生命周期内由于老化带来的参数偏移。
  Aging：Parameter drift over life time.

注/Note：

- 比例输出误差不包括在综合精度误差以内。进行综合精度误差测量时，供电电压值必须为典型供电电压值（VDD= VDD,TYP）。误差带由三段连续直线通过四个相关断点构成。

Ratiometric signal error is not included in the overall accuracy. For error measurements, the supply voltage must have the nominal value (VDD = VDD,Typ).The error band is determined by three continuous lines through four relevant breakpoints.

温度(°C) Temperature(°C)	误差因子 error
-40	3
0	2
85	2
125	3

表2.4 温度误差因子表

Table 2.4 Temperature error coefficient table

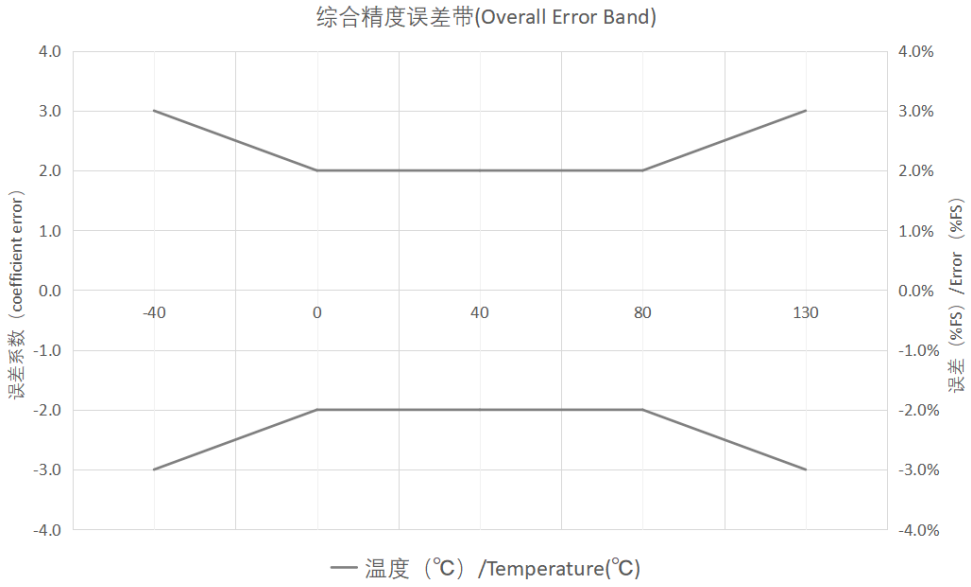


图2.4 综合精度误差带

Figure 2.4 Overall error band

3. 规格参数 SPECIFICATION

3.1 产品极限参数 / Maximum Ratings

项目 Items	最小值 Min	典型值 Type	最大值 Max	单位 Unit	备注 Note
供电VDDHV	-0.3		6.5	V	70℃@1h
工作温度 Working Temperature	-40		130	℃	
存储温度 Storage Temperature	-40		150	℃	
过载压力 Proof Pressure		3X		kPa	300sMax.
爆破压力 Burst Pressure		5X		kPa	300sMax.
ESD防护 ESD Protection	±2			KV	ISO 10605(330pF 2KΩ)

表3.1 产品极限参数表

Table 3.1 Product limit parameter table

3.2 产品电气特性 / Operation Ratings

项目 Items	最小值 Min	典型值 Type	最大值 Max	单位 Unit	备注 Note
供电电压VDD Supply Voltage VDD	4.9	5	5.1	V	
工作电流 I Working current I		5		mA	
VOUT输出 VOUT Output	V_L		V_H	V	Can be customized
上钳位 High Clamping	50	V_{CH}	100		%VDD
下钳位 Low Clamping	0	V_{CL}	50		%VDD
报警高电平 Alarm High Level	98				%VDD
报警低电平 Alarm Low Level			2		%VDD
压力量程 Pressure Range	PL		PH	kPa	Can be customized
综合精度 Overallaccuracy		2		%F.S.	0~85℃
		3		%F.S.	-40~125℃
响应时间 Response Time		10		ms	

表3.2 产品电气性能参数表

Table 3.2 Product electrical performance parameter table

3.3 典型输出曲线 / Typical Transfer Curve

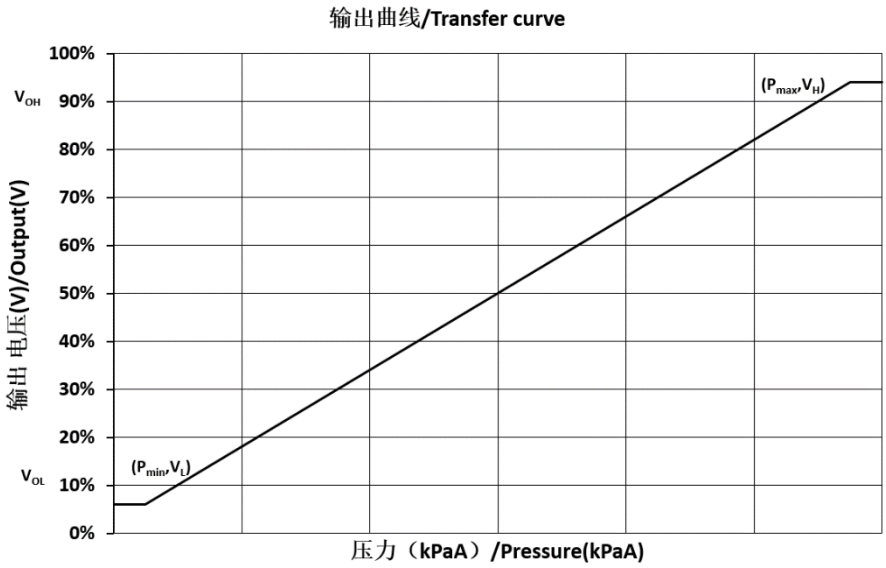


图3.1 产品典型输出曲线

Figure 3.1 Product transfer curve

4. 应用指南 APPLICATION GUIDE

4.1 典型应用电路 / Typical application circuit example

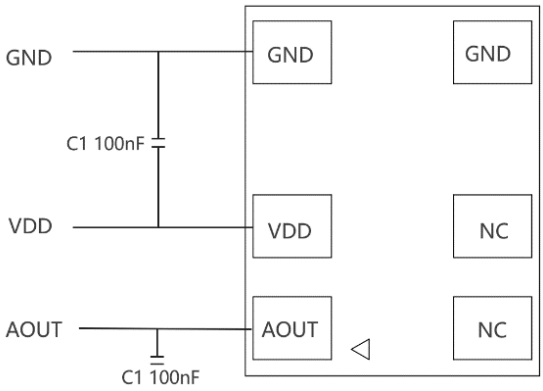


图4.1 典型应用电路图

Figure 4.1 Typical application circuit diagram

注/Note：

- 对于 ESD 更高要求的应用场合，客户可根据需要，在 VOUT与 GND 间以及 VDD与GND 间增加 TVS管。
  For higher ESD requirements, customers can add TVS between VOUT and GND as well as between VDD and GND as required.
- 详细外围推荐电路请联系技术支持工程师提供。
  For more information, please contact our technical support engineer for more information.

4.2 推荐焊盘尺寸 / Recommended Pad Dimension

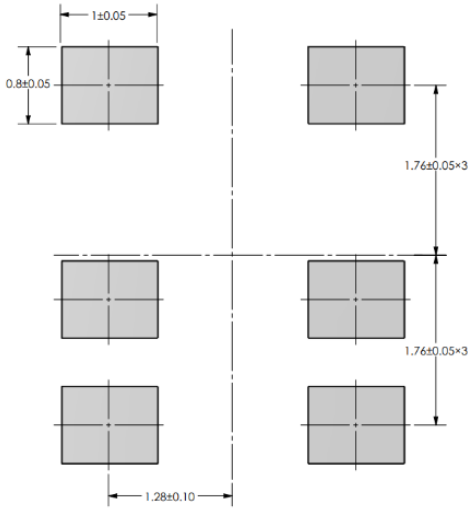


图4.2 产品推荐焊盘尺寸

Figure 4.2 Product recommended pad dimension

5.封装及包装信息 PACKAGE AND WRAP INFORMATION

5.1 产品封装尺寸 / Package Dimension

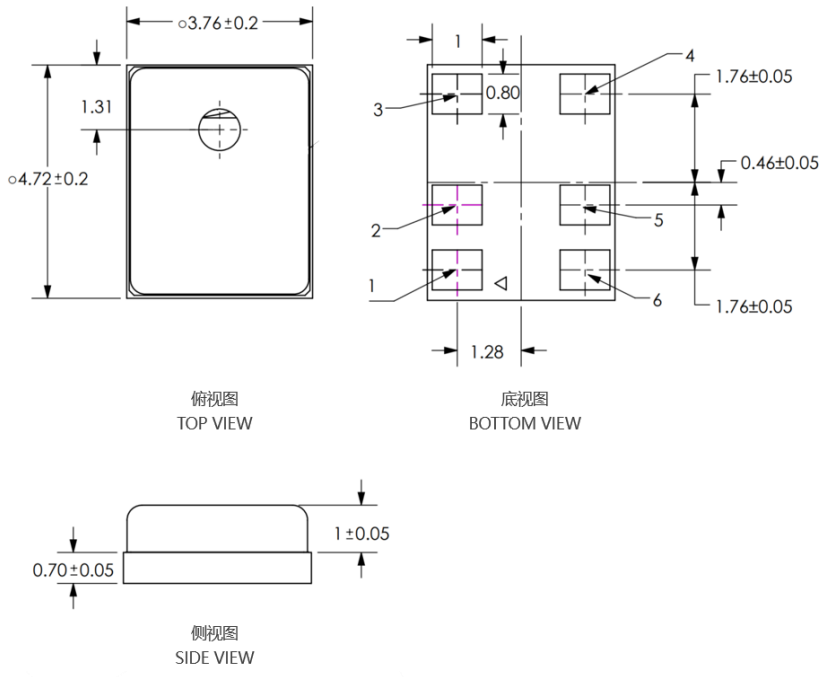


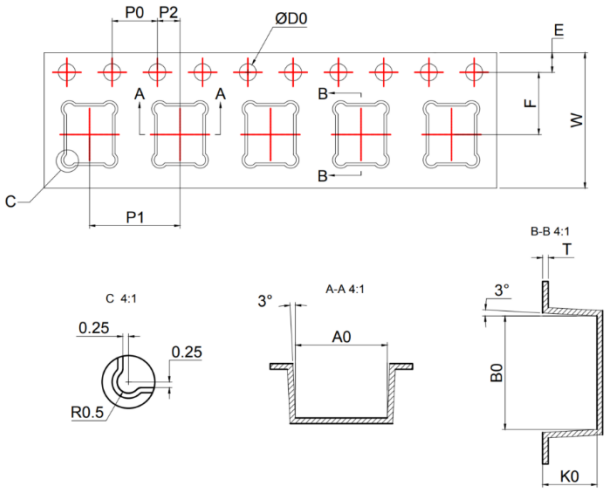
图5.1 产品封装尺寸图

Figure 5.1 Product package dimension diagram

5.2 产品包装定义 / Wrap Definition

- 产品采用采用卷盘包装，每盘4000Pcs，每包2盘。

  The products are packaged in rolls, 4000Pcs per disc, 2 disc per pack.



ITEM	W	E	F	ØD0	K0
DIM(mm)	12.00±0.30	1.75±0.10	5.50±0.10	$1.50^{+0.10}_{0}$	2.40±0.10
ITEM	P0	10P0	P1	A0	B0
DIM(mm)	4.00±0.10	40.00±0.20	8.00±0.10	4.06±0.10	5.02±0.10
ITEM	P2	T			
DIM(mm)	2.00±0.10	0.25±0.05			

图5.2　载带尺寸示意图

Figure 5.2 Belt size diagram

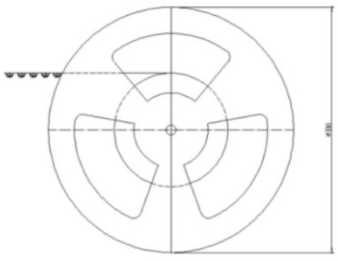


图5.3　13寸卷盘整体示意图

Figure 5.3 Overall schematic diagram of a 13-inch reel

数量 Q ‘ty	包装数/最小包装 Number of packs/minimum packs	4000pcs/盘 4000pcs/tray
	最小包装单元 Smallest packaging unit	2盘/包=8000pcs 2 trays/pack=8000pcs
	包装数/箱（Kg） Packing quantity/carton(Kg)	8盘/箱=32000pcs 8 trays/carton=32000pcs

表5.1　卷盘包装参数

Table 5.1 Reel packing parameters