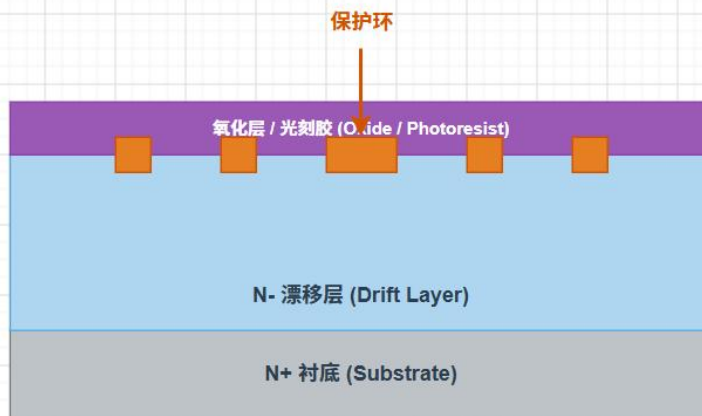


1. 画出保护环终端的器件流程图;



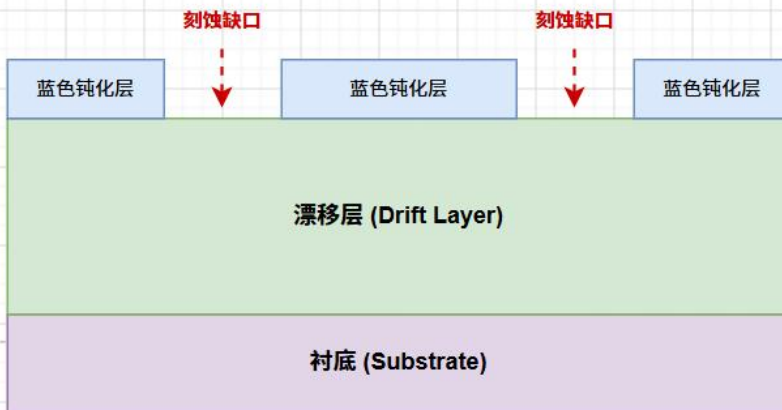
1. 衬底准备(低掺杂N-漂移层)



2. 热生长氧化层, 光刻形成保护环区域, 离子注入形成保护环

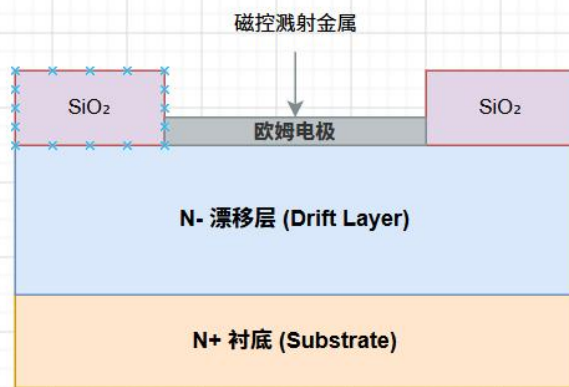


### 3. 去掉氧化层,重新钝化

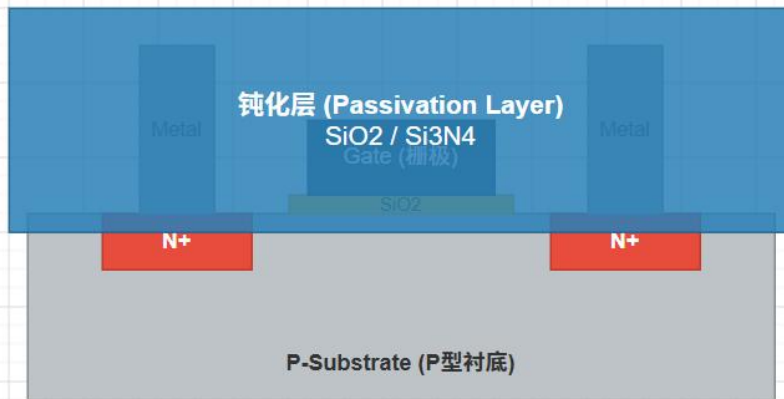


#### 4. 刻蚀

使用任意多边形工具，对蓝色钝化层做裁切，开出多处缺口，保留两侧、中间区域钝化层，露出下方漂移层，形成台面结构。



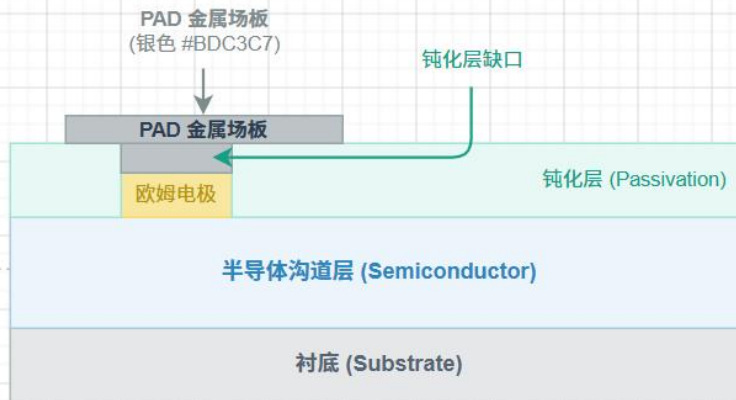
### 5. 磁控溅射欧姆电极



### 6. 沉积钝化层



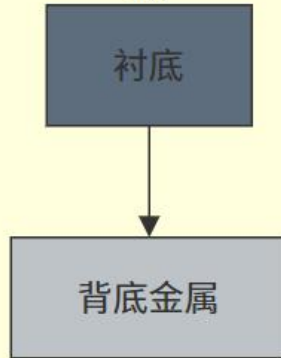
## 7. 刻蚀钝化层



## 8. 沉积 PAD 金属场板

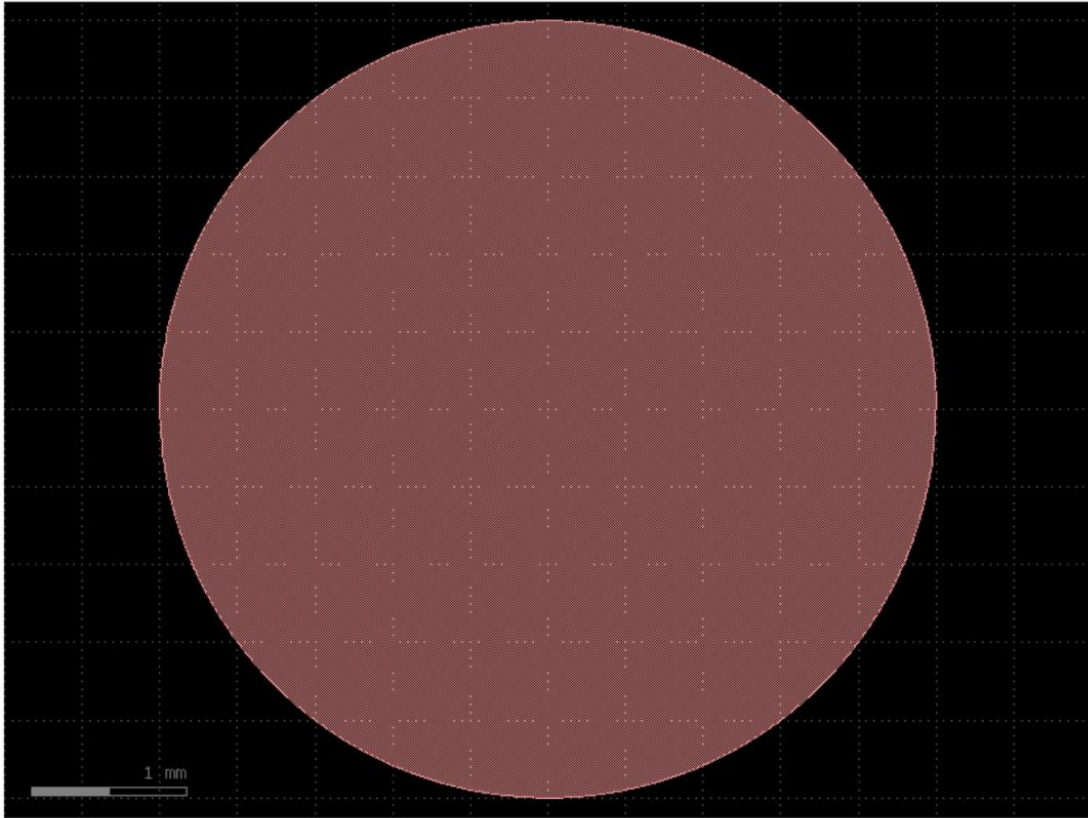
复制第 7 步图形。在钝化层缺口处沉积银色 (#BDC3C7) 金属条，金属条从缺口延伸至钝化层表面，连通内部欧姆电极，构成场板结构。

9. 衬底减薄，背底金属沉积



2. 画出刻蚀终端器件的光刻板  
台面光刻板

## Mask2: Mesa Etching

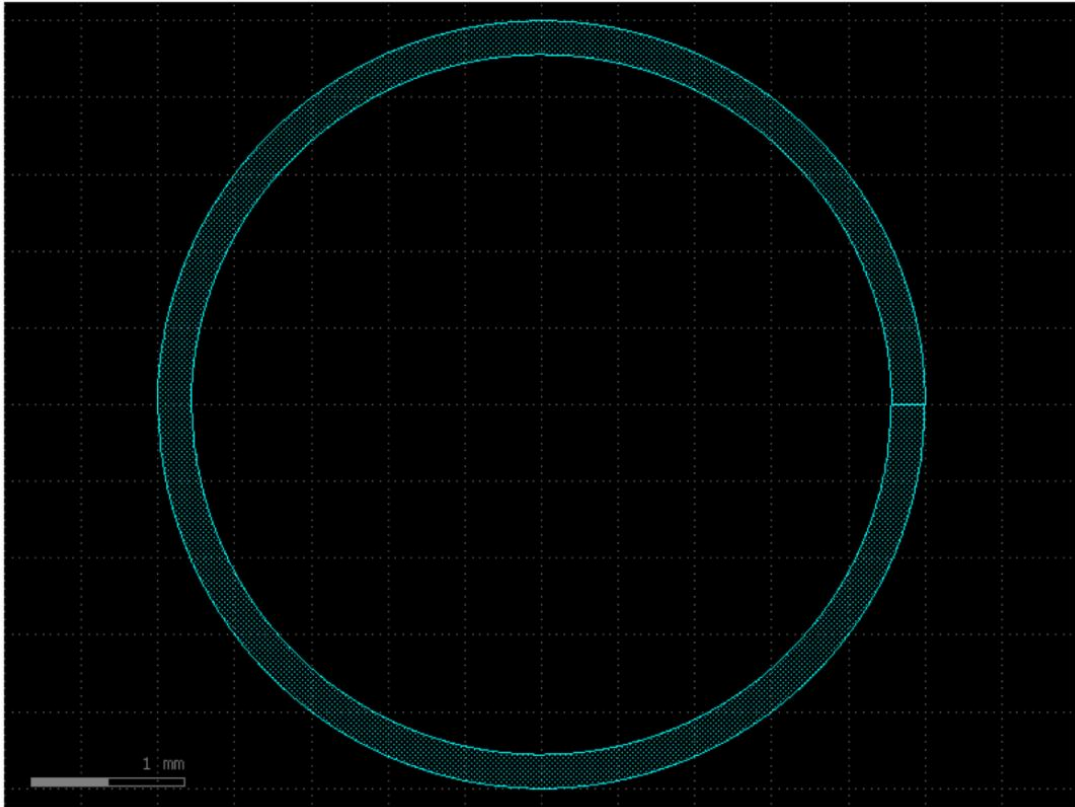


欧姆环光刻板

```
打开(O)  ~ /sic_mask_work
1 import gdsfactory as gf
2 import numpy as np
3 import matplotlib.pyplot as plt
4
5 # 激活工艺库
6 from gdsfactory.gpdk import PDK
7 PDK.activate()
8
9 # 全局尺寸参数 (单位: μm)
10 CHIP_SIZE = 10000
11 CENTER = (0, 0)
12 OHMIC_RING_INNER = 2280
13 OHMIC_RING_OUTER = 2500
14 MESA_RADIUS = 2500
15
16 CONTACT_RING_INNER = 1000
17 CONTACT_RING_OUTER = 1500
18 METAL_RING_INNER = 2300
19 METAL_RING_OUTER = 2650
20
21 # 绘制实心圆形
22 def add_circle(comp, center, radius, layer, n=128):
23     t = np.linspace(0, 2 * np.pi, n, endpoint=True)
24     x = center[0] + radius * np.cos(t)
25     y = center[1] + radius * np.sin(t)
26     comp.add_polygon(list(zip(x, y)), layer=layer)
27
28 # 绘制圆环
29 def add_ring(comp, center, r_in, r_out, layer, n=128):
30     t = np.linspace(0, 2 * np.pi, n, endpoint=True)
31     x_outer = center[0] + r_out * np.cos(t)
32     y_outer = center[1] + r_out * np.sin(t)
33     x_inner = center[0] + r_in * np.cos(t[:-1])
34     y_inner = center[1] + r_in * np.sin(t[:-1])
35     comp.add_polygon(list(zip(x_outer, y_outer)) + list(zip(x_inner, y_inner)), layer=layer)
36
37 # 1. Mask2: 台面光刻板
38 c2 = gf.Component("Mask2_Mesa")
39 add_circle(c2, CENTER, MESA_RADIUS, (1, 0))
40 c2.write_gds("mask2.gds")
41
42 # 2. Mask4: 欧姆环光刻板
43 c4 = gf.Component("Mask4_OhmicRing")
44 add_ring(c4, CENTER, OHMIC_RING_INNER, OHMIC_RING_OUTER, (2, 0))
45 c4.write_gds("mask4.gds")
46
47 # 3. Mask7: 保护环接触光刻板
48 c7 = gf.Component("Mask7_ContactRing")
49 add_ring(c7, CENTER, CONTACT_RING_INNER, CONTACT_RING_OUTER, (3, 0))
50 c7.write_gds("mask7.gds")
51
52 # 4. Mask8: 金属场板光刻板
53 c8 = gf.Component("Mask8_MetalFieldPlate")
54 add_ring(c8, CENTER, METAL_RING_INNER, METAL_RING_OUTER, (4, 0))
55 c8.write_gds("mask8.gds")
56
57 # 总叠加版图
58 c_total = gf.Component("Total_Overview")
59 add_circle(c_total, CENTER, MESA_RADIUS, (1, 0))
60 add_ring(c_total, CENTER, OHMIC_RING_INNER, OHMIC_RING_OUTER, (2, 0))
```

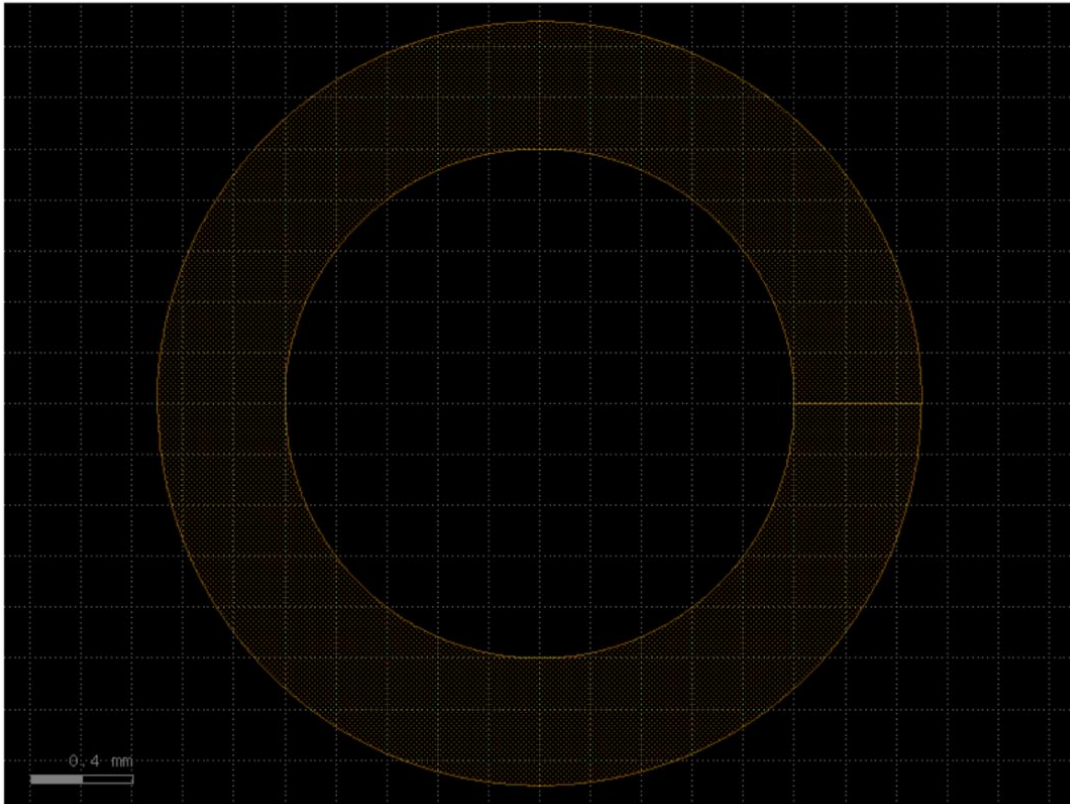
```
st rece 46
/sic_ma 47 # 3. Mask7: 保护环接触光刻板
actory 48 c7 = gf.Component("Mask7_ContactRing")
cannot 49 add_ring(c7, CENTER, CONTACT_RING_INNER, CONTACT_RING_OUTER, (3, 0))
/sic_ma 50 c7.write_gds("mask7.gds")
y: 未找 51
/sic_ma 52 # 4. Mask8: 金属场板光刻板
/sic_ma 53 c8 = gf.Component("Mask8_MetalFieldPlate")
st rece 54 add_ring(c8, CENTER, METAL_RING_INNER, METAL_RING_OUTER, (4, 0))
/sic_ma 55 c8.write_gds("mask8.gds")
56
oment(c 57 # 总叠加版图
58 c_total = gf.Component("Total_Overview")
59 add_circle(c_total, CENTER, MESA_RADIUS, (1, 0))
oly[:;8 60 add_ring(c_total, CENTER, OHMIC_RING_INNER, OHMIC_RING_OUTER, (2, 0))
61 add_ring(c_total, CENTER, CONTACT_RING_INNER, CONTACT_RING_OUTER, (3, 0))
oo many 62 add_ring(c_total, CENTER, METAL_RING_INNER, METAL_RING_OUTER, (4, 0))
/sic_ma 63 c_total.write_gds("total_overview.gds")
64
n 65 print("✅ 所有GDS版图文件生成完成!")
66
om /usr 67 # ===== 用gdsfactory自带的plot生成图片 (兼容所有版本) =====
/sic_ma 68 def save_png(component, filename, title):
/sic_ma 69     fig, ax = plt.subplots(figsize=(5, 5))
.py 70     component.plot(ax=ax)
图文件生 71     ax.set_aspect("equal")
图截图生 72     ax.axis("off")
/sic_ma 73     ax.set_title(title, fontsize=10)
sk2.png 74     plt.tight_layout()
/sic_ma 75     plt.savefig(filename, dpi=300)
t/hgfs/ 76     plt.close(fig)
/sic_ma 77
sk4.png 78 # 生成所有PNG截图
/sic_ma 79 save_png(c2, "mask2.png", "Mask2: Mesa Etching")
80 save_png(c4, "mask4.png", "Mask4: Ohmic Ring")
81 save_png(c7, "mask7.png", "Mask7: Field Ring Contact")
82 save_png(c8, "mask8.png", "Mask8: Metal Field Plate")
83 save_png(c_total, "total_overview.png", "Total Overview")
84
85 print("✅ 所有PNG版图截图生成完成!")
86
```

Mask4: Ohmic Ring



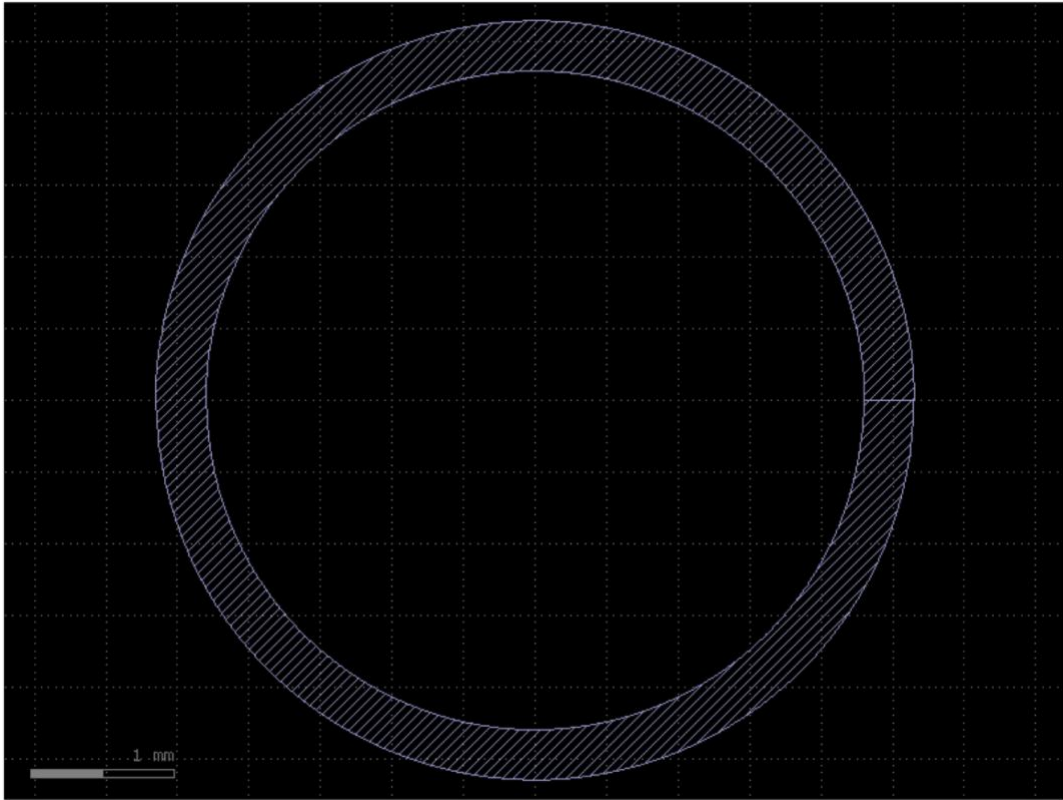
保护环接触光刻板

Mask7: Field Ring Contact



金属场板光刻板

### Mask8: Metal Field Plate



总览版图

# Total Overview

