



WLCSP 封装产品说明



目录 & 内容简介

目录

- 一、 WLCSP 封装介绍
- 二、 GLF 各尺寸产品外观尺寸
- 三、 各尺寸对应的的锡球（bump）物理特性
- 四、 建议&总结

内容简介

本文档内容主要介绍WLCSP封装特点和相关的物理特性，供客户参考以帮助客户规避或改善在SMT，组装等使用情景下的问题或风险。

1. 什么是WLCSP 封装

晶圆级芯片规模封装（Wafer Level Chip Scale Packaging，简称WLCSP），即晶圆级芯片封装方式，不同于传统的芯片封装方式（先切割再封装，而封装后至少增加原芯片20%的体积），此种最新技术是先在整个晶圆上进行封装和测试，然后才切割成一个个的IC颗粒，因此封装后的体积即等同IC裸晶的原尺寸。

2. WLCSP的结构

WLCSP 由四部分组成，芯片直接在硅基芯片上植球将芯片内部电路引出。

- Silicon Die
- Re-passivation
- UBM
- Ball (bump)

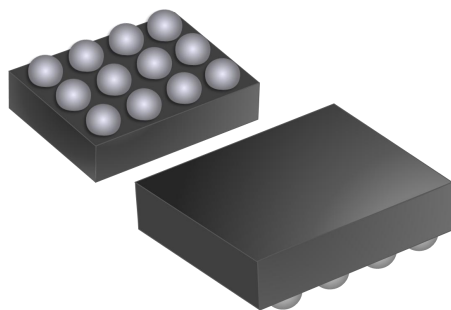


图1 WLCSP整体结构图

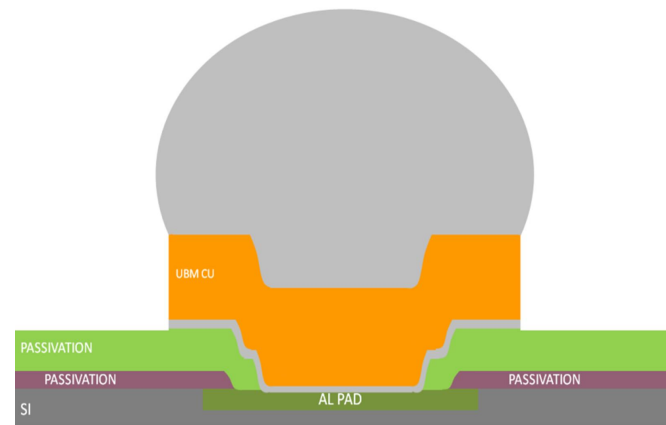


图2 WLCSP bump 结构图

3. WLCSP的优点

- WLCSP晶圆级芯片封装方式的最大特点是有效地缩减了封装体积，使封装外形更加轻薄。故符合便携式产品轻薄短小的特性需求。
- WLCSP 直接由bump引出芯片内部电路相比于打线产品具有优良的电气特性，提升了产品数据传输的速度和稳定性。
- WLCSP 没有传统封装的塑封料或者陶瓷包装，所以产品在工作中产生的热量可以有效的散发，从而保持产品的优良参数特性。

4. WLCSP的湿敏等级

由于传统封装芯片存在塑封料等有机组分，这些组分暴露在空气中会吸湿，当吸湿到达一定量时，芯片在SMT过程中，芯片受热导致内部潮气能产生足够的蒸汽压，从而导致芯片不同组分之间分层，严重时发生“爆米花”状况。

由于WLCSP 芯片没有塑封料等有机组分，芯片主体只由硅基体组成，因此，天生湿敏等级可到达MSL1。

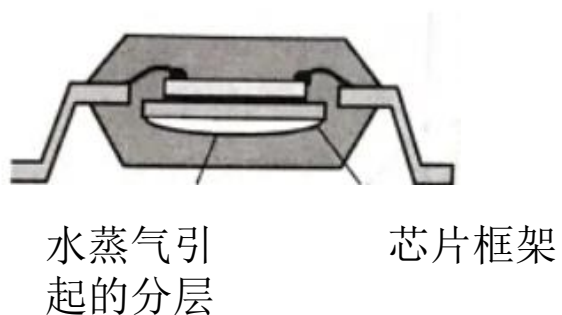


图3 塑封芯片分层示意图

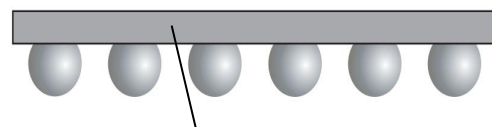
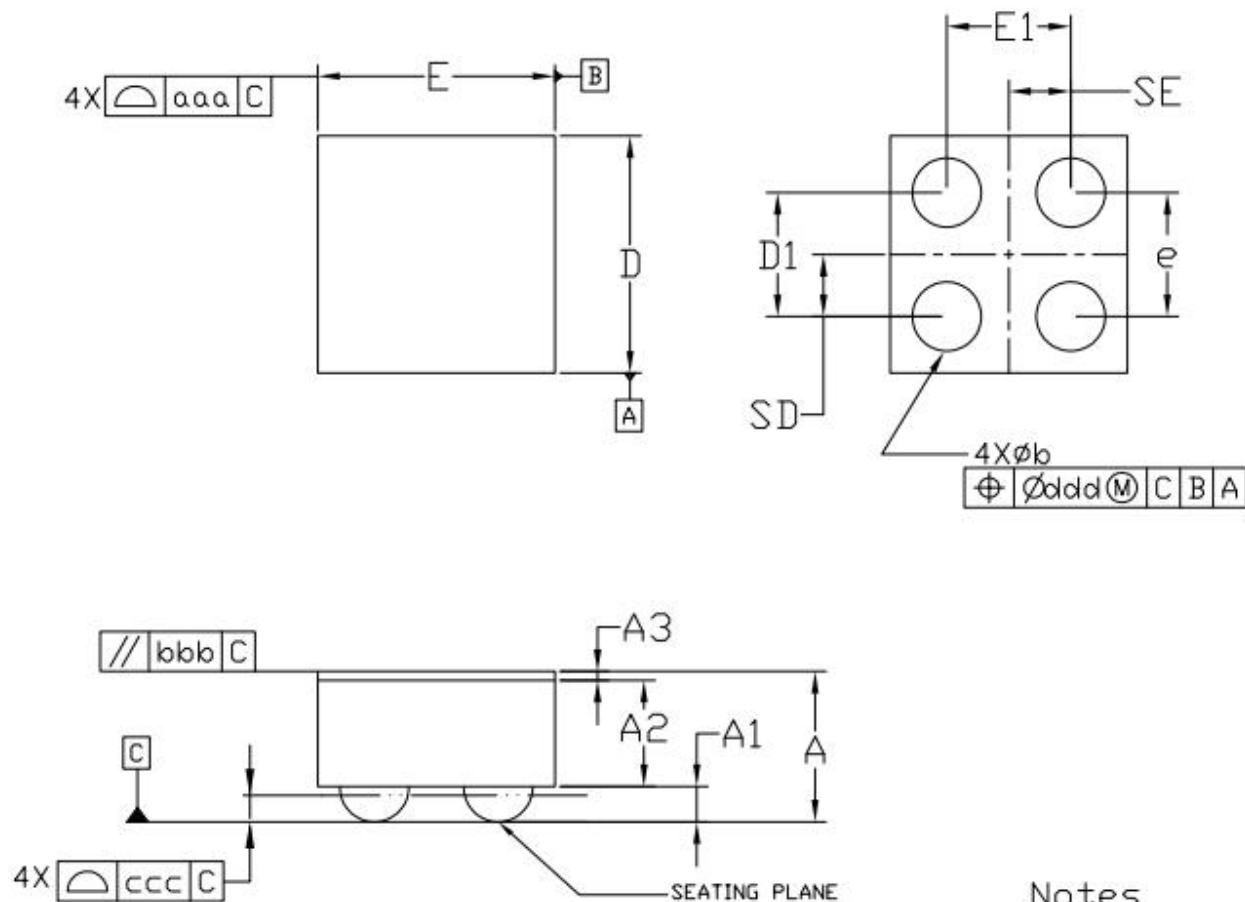


图4 WLCSP芯片示意图

LEVEL	FLOOR LIFE ⁴		SOAK REQUIREMENTS ³				
			STANDARD		ACCELERATED EQUIVALENT ¹		
					eV 0.40-0.48	eV 0.30-0.39	CONDITION
	TIME	CONDITION	TIME (hours)	CONDITION	TIME (hours)	TIME (hours)	
1	Unlimited	≤30 °C/85% RH	168 +5/-0	85 °C/85% RH	NA	NA	NA
2	1 year	≤30 °C/60% RH	168 +5/-0	85 °C/60% RH	NA	NA	NA
2a	4 weeks	≤30 °C/60% RH	696 ² +5/-0	30 °C/60% RH	120 +1/-0	168 +1/-0	60 °C/60% RH
3	168 hours	≤30 °C/60% RH	192 ² +5/-0	30 °C/60% RH	40 +1/-0	52 +1/-0	60 °C/60% RH
4	72 hours	≤30 °C/60% RH	96 ² +2/-0	30 °C/60% RH	20 +0.5/-0	24 +0.5/-0	60 °C/60% RH
5	48 hours	≤30 °C/60% RH	72 ² +2/-0	30 °C/60% RH	15 +0.5/-0	20 +0.5/-0	60 °C/60% RH
5a	24 hours	≤30 °C/60% RH	48 ² +2/-0	30 °C/60% RH	10 +0.5/-0	13 +0.5/-0	60 °C/60% RH
6	Time on Label (TOL)	≤30 °C/60% RH	TOL	30 °C/60% RH	NA	NA	NA

表1 湿敏等级表

GLF WLCSP POD- 0.67x0.67mm (带背膜)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.389	0.425	0.461
A1	0.075	0.100	0.125
A2	0.275	0.300	0.325
A3	0.020	0.025	0.030
D	0.655	0.670	0.685
E	0.655	0.670	0.685
D1	0.300	0.350	0.400
E1	0.300	0.350	0.400
b	0.165	0.195	0.225
e	0.350 BSC		
SD	0.175 BSC		
SE	0.175 BSC		
Tol. of Form&Position			
aaa	0.05		
bbb	0.05		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.425mm

球高: 0.1mm

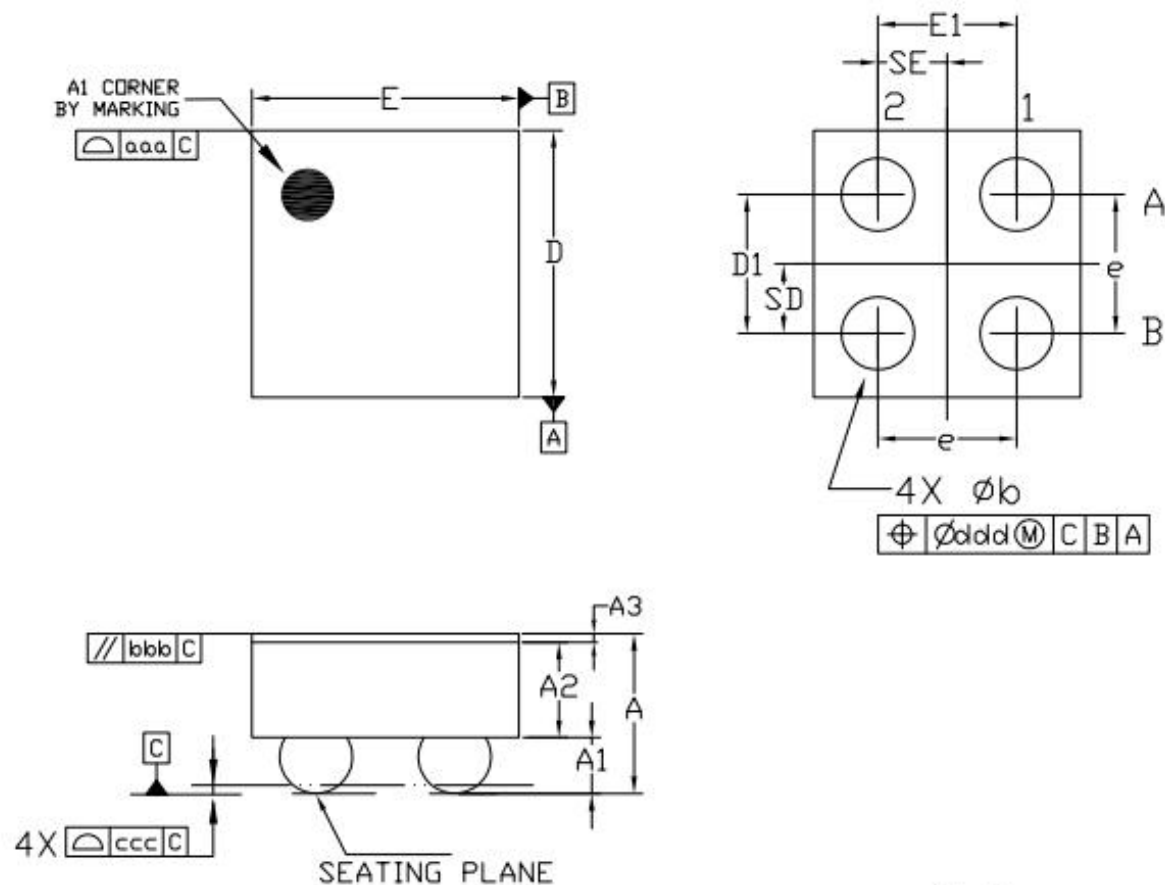
硅基厚度: 0.3mm

背膜厚度: 25um

Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 0.77x0.77mm (带背膜)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.410	0.460	0.510
A1	0.135	0.160	0.185
A2	0.250	0.275	0.300
A3	0.020	0.025	0.030
D	0.755	0.770	0.785
E	0.755	0.770	0.785
D1	0.350	0.400	0.450
E1	0.350	0.400	0.450
b	0.170	0.210	0.250
e	0.400 BSC		
SD	0.200 BSC		
SE	0.200 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.46mm

球高: 0.16mm

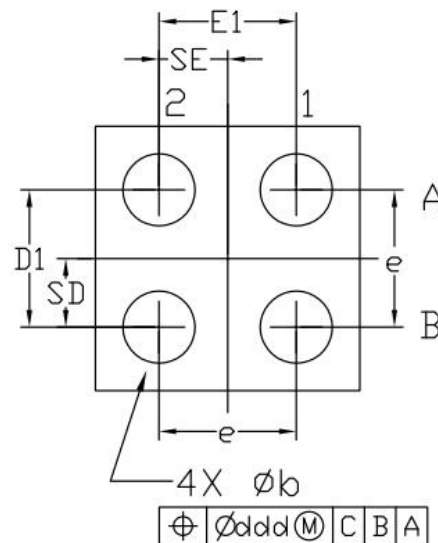
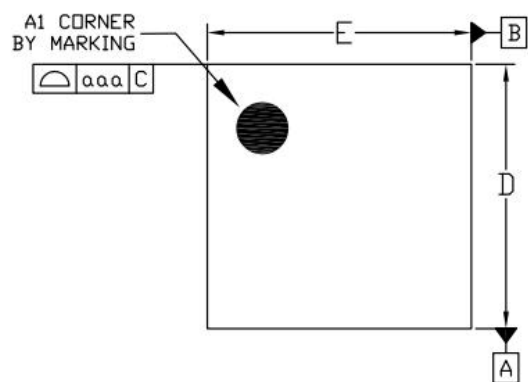
硅基厚度: 0.275mm

背膜厚度: 25um

Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 0.77x0.77mm (不帶背膜)



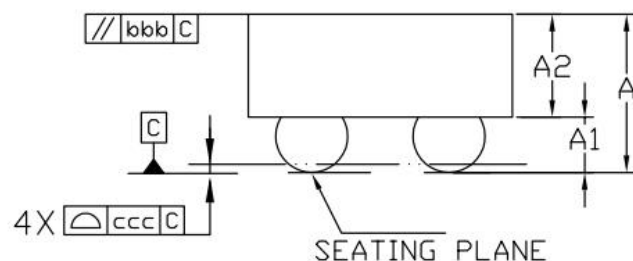
Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.410	0.460	0.510
A1	0.135	0.160	0.185
A2	0.275	0.300	0.325
D	0.755	0.770	0.785
E	0.755	0.770	0.785
D1	0.350	0.400	0.450
E1	0.350	0.400	0.450
b	0.170	0.210	0.250
e	0.400 BSC		
SD	0.200 BSC		
SE	0.200 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.46mm

球高: 0.16mm

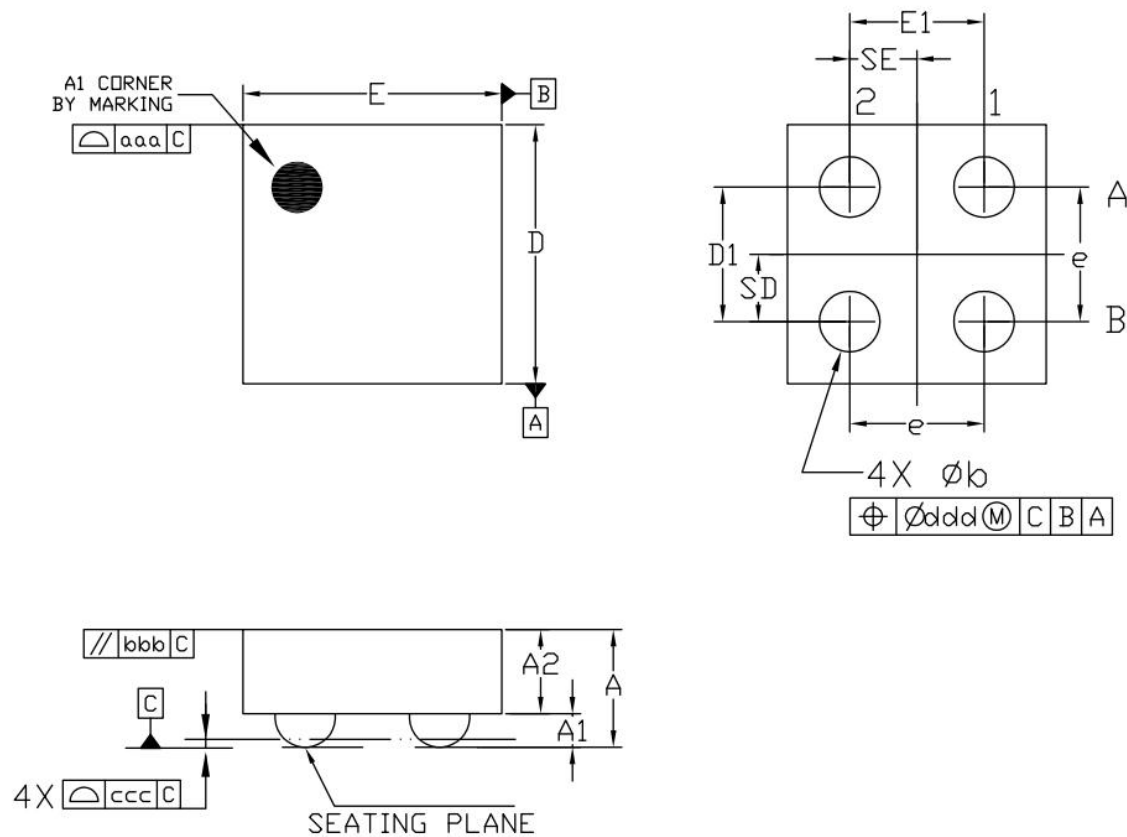
硅基厚度: 0.3mm



Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 0.77x0.77mm (不帶背膜/薄款)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.300	0.350	0.400
A1	0.075	0.100	0.125
A2	0.225	0.250	0.275
D	0.755	0.770	0.785
E	0.755	0.770	0.785
D1	0.350	0.400	0.450
E1	0.350	0.400	0.450
b	0.145	0.180	0.215
e	0.400 BSC		
SD	0.200 BSC		
SE	0.200 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.35mm

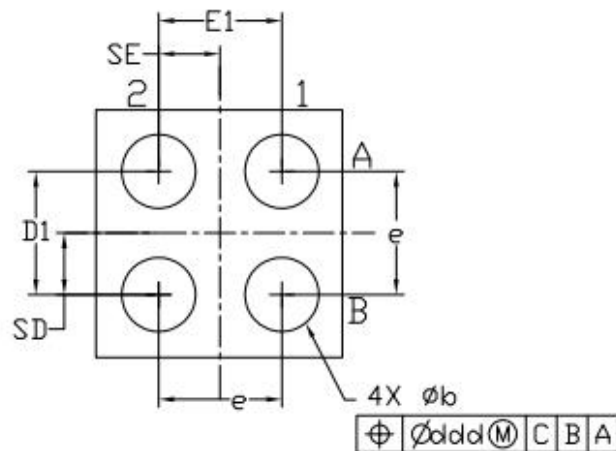
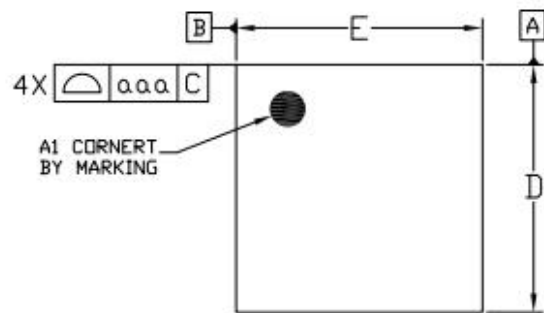
球高: 0.1mm

硅基厚度: 0.25mm

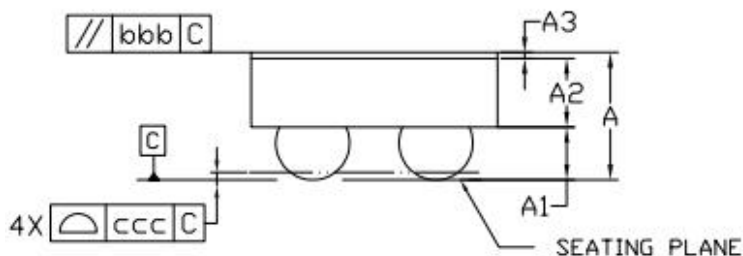
Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 0.97x0.97mm (带背膜)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.225	0.250	0.275
A2	0.255	0.275	0.300
A3	0.020	0.025	0.030
D	0.960	0.970	0.985
E	0.960	0.970	0.985
D1	0.450	0.500	0.550
E1	0.450	0.500	0.550
b	0.260	0.310	0.360
e	0.500 BSC		
SD	0.250 BSC		
SE	0.250 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		



Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

关键尺寸

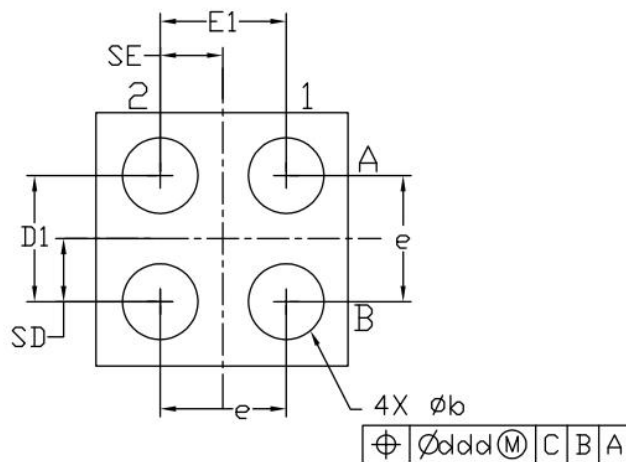
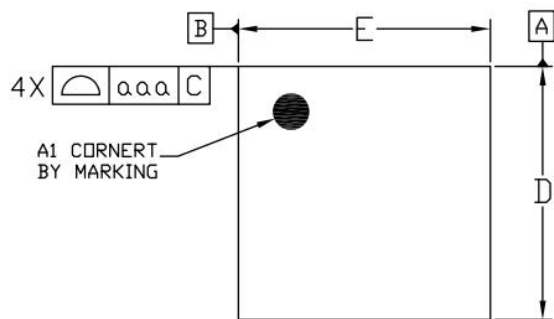
产品厚度: 0.55mm

球高: 0.25mm

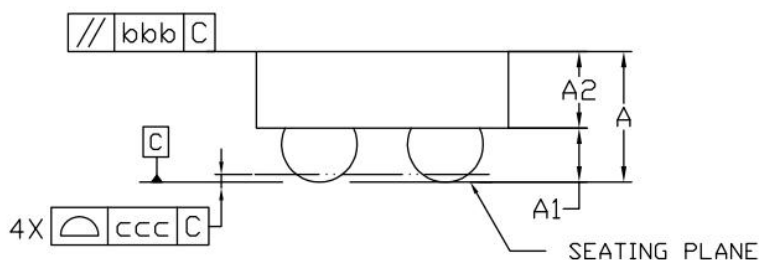
硅基厚度: 0.275mm

背膜厚度: 25um

GLF WLCSP POD- 0.97x0.97mm (不帶背膜)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.225	0.250	0.275
A2	0.275	0.300	0.325
D	0.955	0.970	0.985
E	0.955	0.970	0.985
D1	0.450	0.500	0.550
E1	0.450	0.500	0.550
b	0.260	0.310	0.360
e	0.500 BSC		
SD	0.250 BSC		
SE	0.250 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		



Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

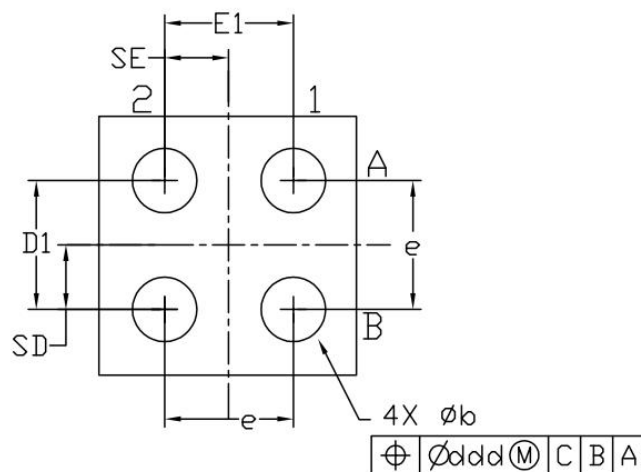
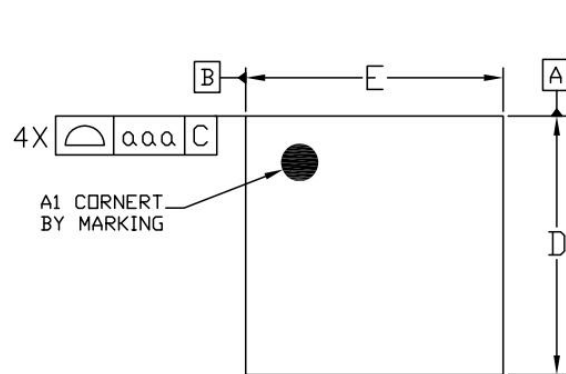
关键尺寸

产品厚度: 0.55mm

球高: 0.25mm

硅基厚度: 0.3mm

GLF WLCSP POD- 0.97x0.97mm (不带背膜/薄款)



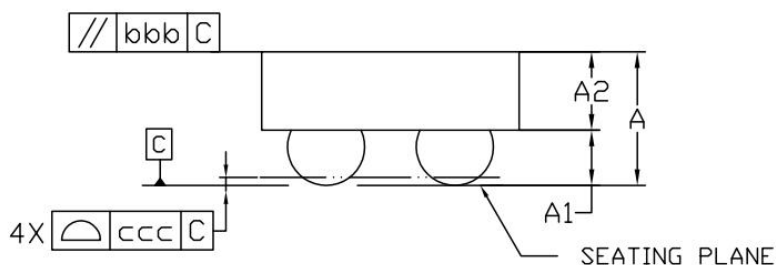
Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.300	0.350	0.400
A1	0.075	0.100	0.125
A2	0.225	0.250	0.275
D	0.955	0.970	0.985
E	0.955	0.970	0.985
D1	0.450	0.500	0.550
E1	0.450	0.500	0.550
b	0.200	0.250	0.300
e	0.500 BSC		
SD	0.250 BSC		
SE	0.250 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.35mm

球高: 0.1mm

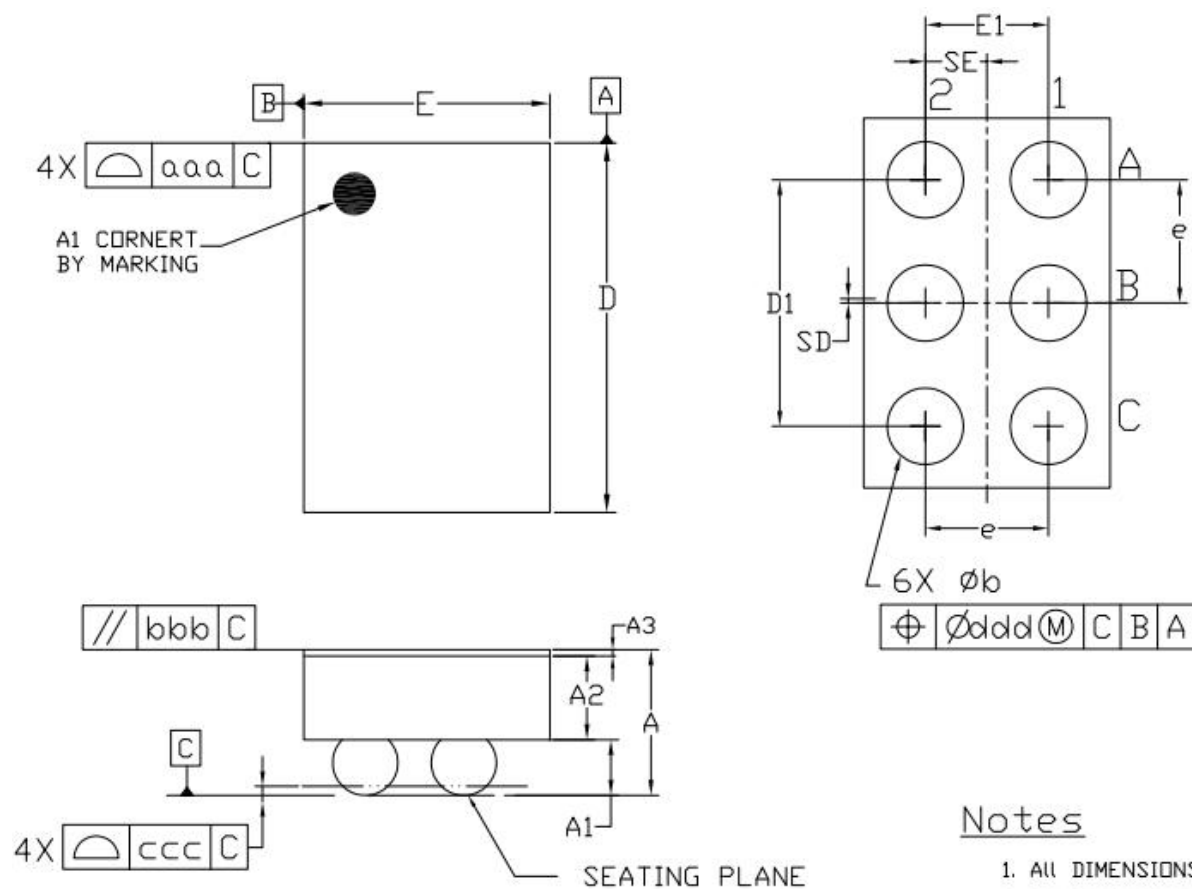
硅基厚度: 0.25mm



Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 0.97x1.47mm (带背膜)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.225	0.250	0.275
A2	0.250	0.275	0.300
A3	0.020	0.025	0.030
D	1.460	1.470	1.485
E	0.960	0.970	0.985
D1	0.950	1.000	1.050
E1	0.450	0.500	0.550
b	0.260	0.310	0.360
e	0.500 BSC		
SD	0.000 BSC		
SE	0.250 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

关键尺寸

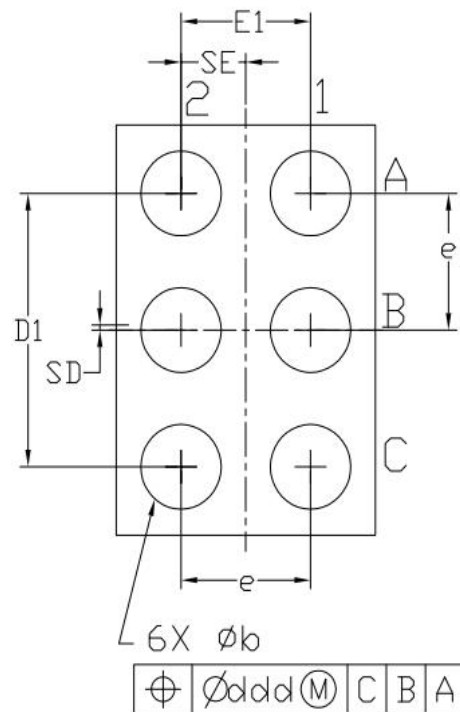
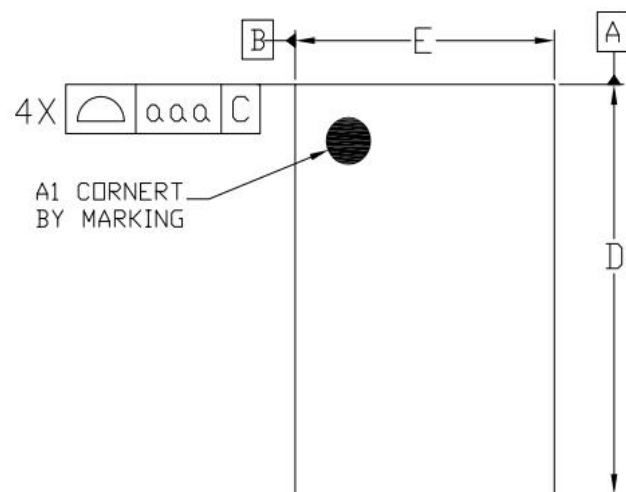
产品厚度: 0.55mm

球高: 0.25mm

硅基厚度: 0.275mm

背膜厚度: 25um

GLF WLCSP POD- 0.97x1.47mm (不帶背膜)



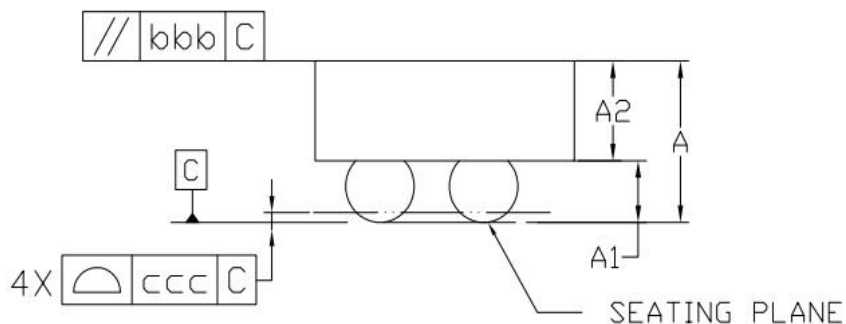
Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.225	0.250	0.275
A2	0.275	0.300	0.325
D	1.460	1.470	1.485
E	0.960	0.970	0.985
D1	0.950	1.000	1.050
E1	0.450	0.500	0.550
b	0.260	0.310	0.360
e	0.500 BSC		
SD	0.000 BSC		
SE	0.250 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.55mm

球高: 0.25mm

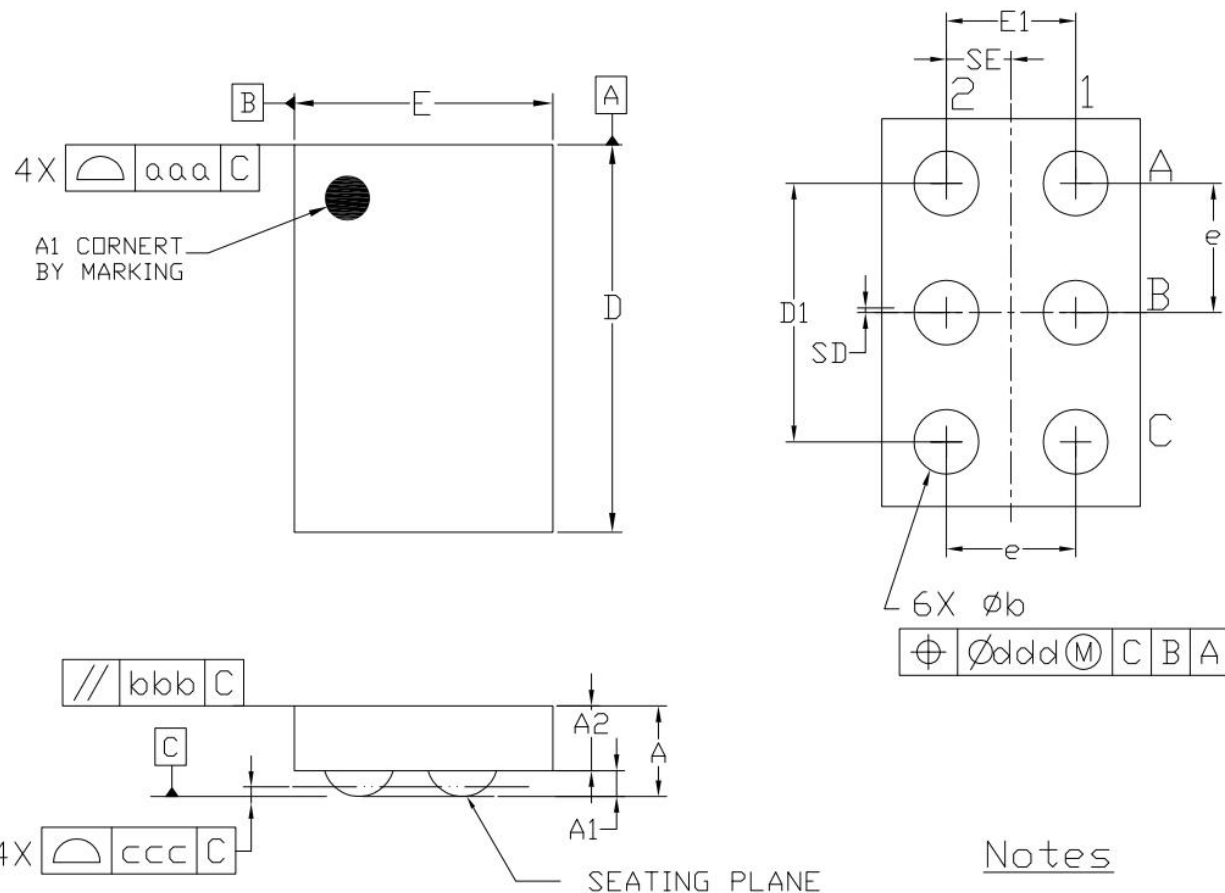
硅基厚度: 0.3mm



Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 0.97x1.47mm (不带背膜/薄款)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.300	0.350	0.400
A1	0.075	0.100	0.125
A2	0.225	0.250	0.275
D	1.460	1.470	1.485
E	0.960	0.970	0.985
D1	0.950	1.000	1.050
E1	0.450	0.500	0.550
b	0.210	0.250	0.290
e	0.500 BSC		
SD	0.000 BSC		
SE	0.250 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.35mm

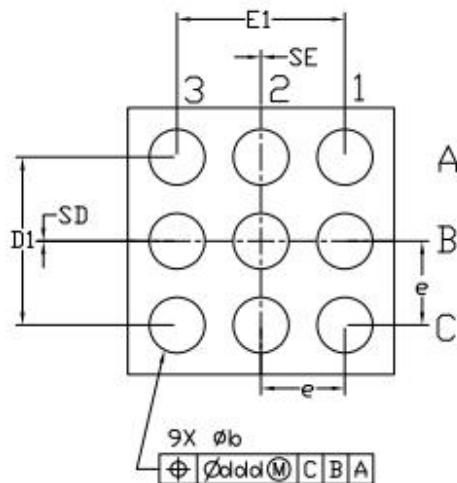
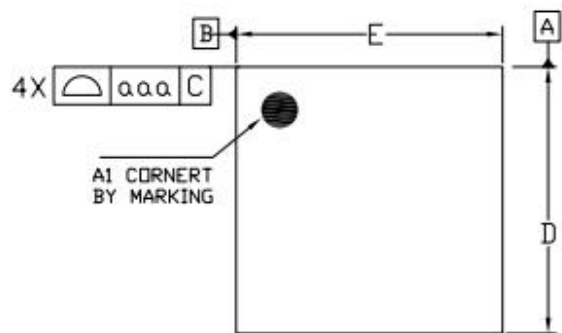
球高: 0.1mm

硅基厚度: 0.25mm

Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 1.27x1.27mm (带背膜)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.175	0.200	0.225
A2	0.300	0.325	0.350
A3	0.020	0.025	0.030
D	1.255	1.270	1.285
E	1.255	1.270	1.285
D1	0.750	0.800	0.850
E1	0.750	0.800	0.850
b	0.215	0.265	0.315
e	0.400 BSC		
SD	0.000 BSC		
SE	0.000 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

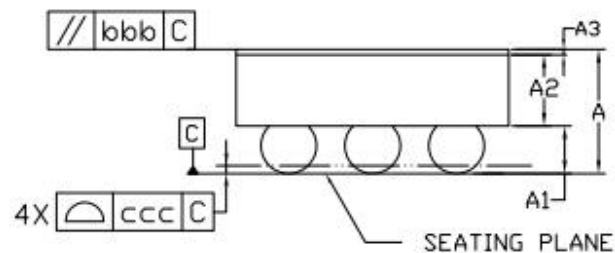
关键尺寸

产品厚度: 0.55mm

球高: 0.2mm

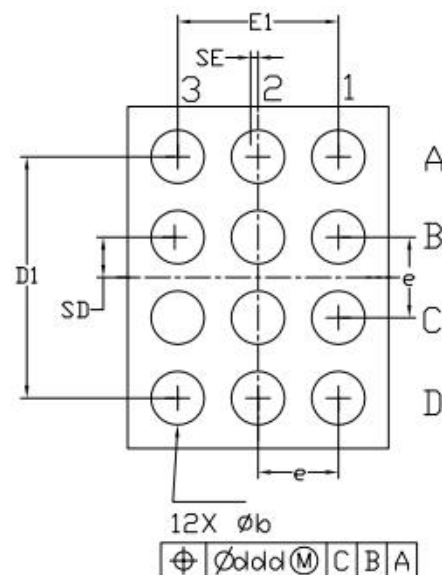
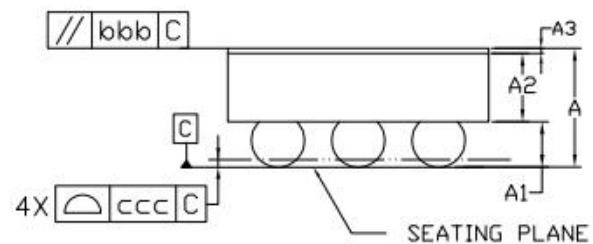
硅基厚度: 0.325mm

背膜厚度: 25um



Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.175	0.200	0.225
A2	0.300	0.325	0.350
A3	0.020	0.025	0.030
D	1.655	1.670	1.685
E	1.255	1.270	1.285
D1	1.150	1.200	1.250
E1	0.750	0.800	0.850
b	0.215	0.265	0.315
e	0.400 BSC		
SD	0.200 BSC		
SE	0.000 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.55mm

球高: 0.2mm

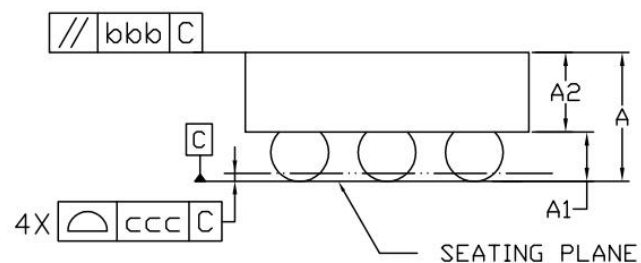
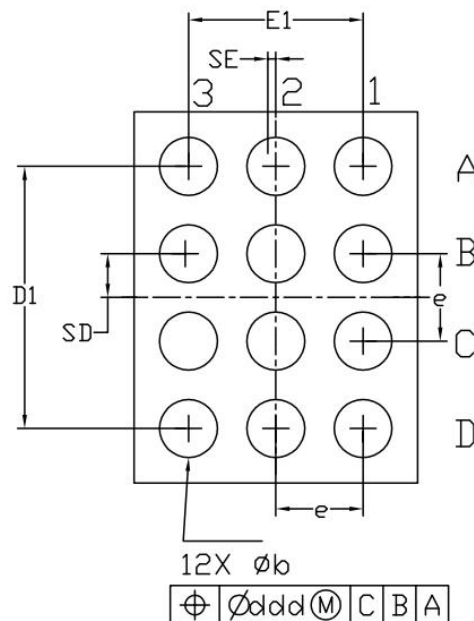
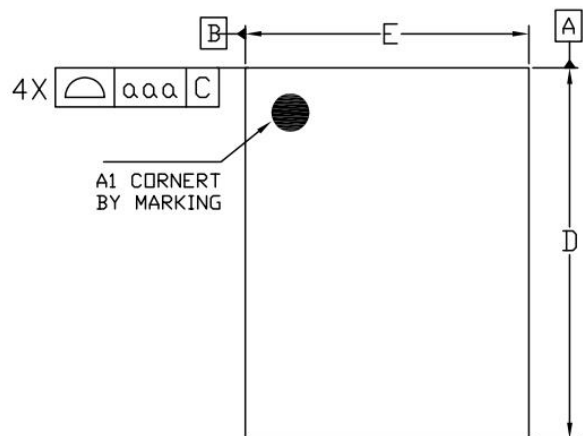
硅基厚度: 0.325mm

背膜厚度: 25um

Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 1.27x1.67mm (不帶背膜)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.500	0.550	0.600
A1	0.175	0.200	0.225
A2	0.325	0.350	0.375
D	1.655	1.670	1.685
E	1.255	1.270	1.285
D1	1.150	1.200	1.250
E1	0.750	0.800	0.850
b	0.215	0.265	0.315
e	0.400 BSC		
SD	0.200 BSC		
SE	0.000 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.55mm

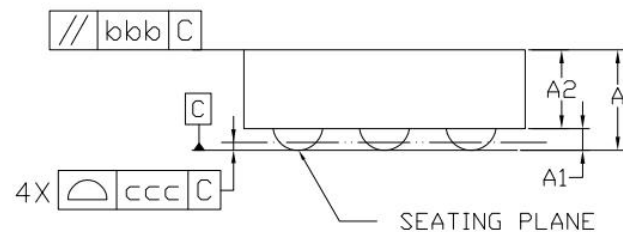
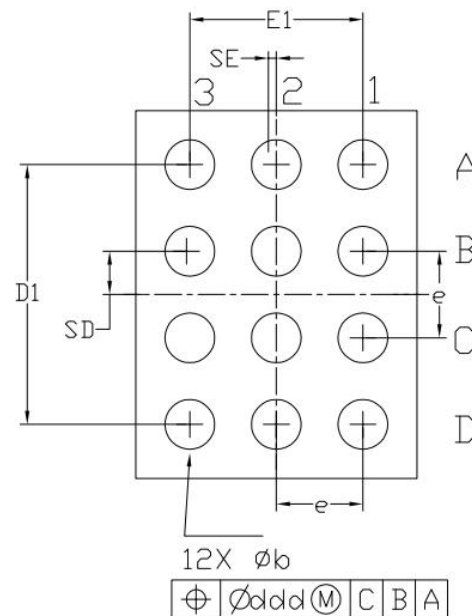
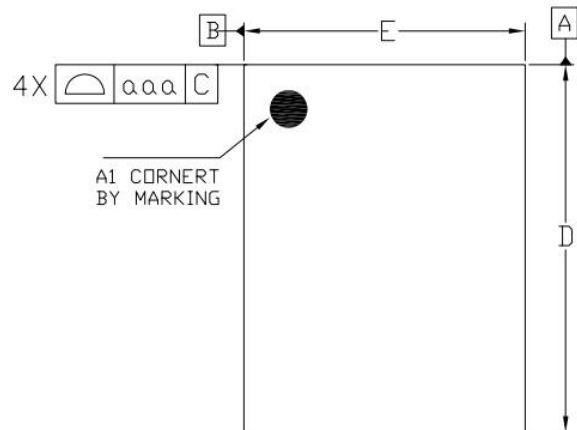
球高: 0.2mm

硅基厚度: 0.35mm

Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

GLF WLCSP POD- 1.27x1.67mm (不带背膜/薄款)



Dimensional Ref.			
REF.	Min.	Nom.	Max.
A	0.300	0.350	0.400
A1	0.075	0.100	0.125
A2	0.225	0.250	0.275
D	1.655	1.670	1.685
E	1.255	1.270	1.285
D1	1.150	1.200	1.250
E1	0.750	0.800	0.850
b	0.200	0.230	0.260
e	0.400 BSC		
SD	0.200 BSC		
SE	0.000 BSC		
Tol. of Form&Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		

关键尺寸

产品厚度: 0.35mm

球高: 0.1mm

硅基厚度: 0.25mm

Notes

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

SAC305

SAC305 Solder Sphere

PRODUCT DESCRIPTION

This product is an alternate lead-free choice to replace Tin-Lead solder sphere to meet ROHS and used to form reliable conductive interconnections of most electronic devices (ex: BGA, WLCSP, μ BGA, and etc..). Appropriate ball placement machine picks solder spheres electronic devices and following thermal equipment (ex: reflow oven, hot plate, and etc..) with proper reflow profile to melt solder sphere that forms a strong IMC layer between solder spheres and electronic devices.

TYPICAL PROPERTIES

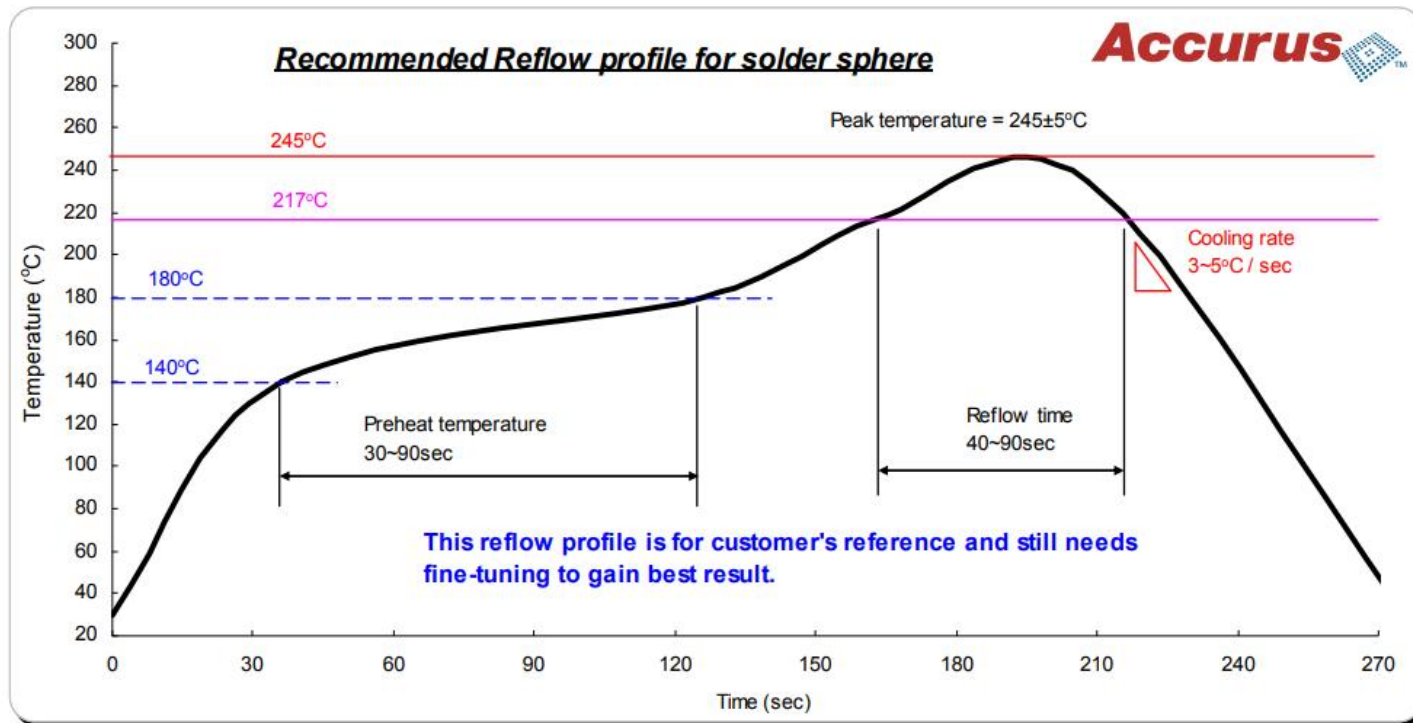
Property	Test Method	Value
Color	As-received Visual	Silvery-white
Color	As-reflowed Visual	Silvery-white
Odor	As-received Smelling	Odorless
Specific Gravity	Instrument: Electronic Densimeter The solder ingot is placed in the electronic densimeter and measured the specific gravity based on Archimedes Method.	= 7.4 g/cm ³

锡球规格书-SAC305

Property	Test Method	Value
Melting Temperature	Instrument: DSC (Differential Scanning Calorimeter), PERKIN ELMER PYRIS-6 DSC Appropriately 2 mg of solder spheres were put in DSC with 5°C/min ramp up rate till DSC curve appears fully. 1% of curve area is defined as the <u>solidus temperature</u> and 99% of curve area is defined as the <u>liquidus temperature</u> .	<u>Solidus temperature</u> = 217 °C <u>Liquidus temperature</u> = 221 °C
Compositions	Instrument: Composition Analyzes Machine, AES SpectroLAB F, Spectrometry (Spark-OES) instrument Using AES (OES) method, elements were analyzed to determine the composition of sphere samples. The results were recorded in weight percentage.	Ag = 3.0 wt% Cu = 0.5 wt% Sn = Remained Other elements ①
Estimated Storage Life		1. 12 months @ 30°C max / 60%RH max

REFLOW PROCESS GUIDELINES

Following figure is a typical reflow profile^③ for this product to joint on most electronic devices.



STORAGE AND HANDLING

This product is supplied in a range of jar sizes (For more detail information, please contact our sales office.), and must be stored @ 30°C max / 60%RH max. If storage temperature is lower than operation temperature, jar must be completely thawed before opening. This product can be used after opening the jars without any preparation.

Preliminary Technical Data Sheet

SAC266 Solder Sphere

PRODUCT DESCRIPTION

This product is an alternate lead-free choice to replace Tin-Lead solder sphere to meet ROHS and used to form reliable conductive interconnections of most electronic devices (ex: BGA, WLCSP, μ BGA, and etc..). Appropriate ball placement machine picks solder spheres electronic devices and following thermal equipment (ex: reflow oven, hot plate, and etc..) with proper reflow profile to melt solder sphere that forms a strong IMC layer between solder spheres and electronic devices.

TYPICAL PROPERTIES

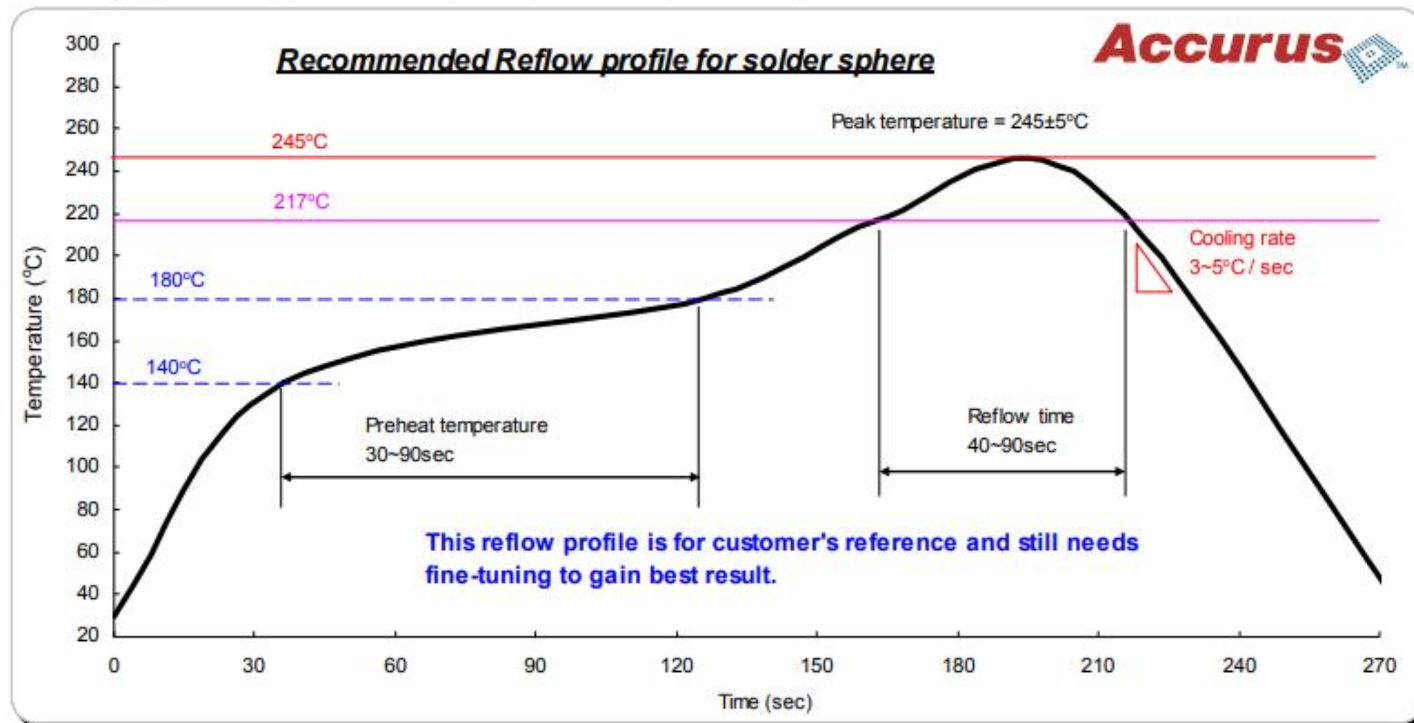
Property	Test Method	Value
Color	As-received Visual	Silvery-white
Color	As-reflowed Visual	Silvery-white
Odor	As-received Smelling	Odorless
Specific Gravity	Instrument: Electronic Densimeter The solder ingot is placed in the electronic densimeter and measured the specific gravity based on Archimedes Method.	= 7.4 g/cm ³

锡球规格书-SAC266

Property	Test Method	Value
Melting Temperature	Instrument: DSC (Differential Scanning Calorimeter), PERKIN ELMER PYRIS-6 DSC Appropriately 2 mg of solder spheres were put in DSC with 5°C/min ramp up rate till DSC curve appears fully. 1% of curve area is defined as the <u>solidus temperature</u> and 99% of curve area is defined as the <u>liquidus temperature</u> .	<u>Solidus temperature</u> = 217 °C <u>Liquidus temperature</u> = 222 °C
Compositions	Instrument: Composition Analyzes Machine, AES SpectroLAB F, Spectrometry (Spark-OES) instrument Using AES (OES) method, elements were analyzed to determine the composition of sphere samples. The results were recorded in weight percentage.	Ag = 2.6 wt% Cu = 0.6 wt% Sn = Remained Other elements ①
Estimated Storage Life		1. 12 months @ 30°C max / 60%RH max

REFLOW PROCESS GUIDELINES

Following figure is a typical reflow profile③ for this product to joint on most electronic devices.



STORAGE AND HANDLING

This product is supplied in a range of jar sizes (For more detail information, please contact our sales office.), and must be stored @ 30°C max / 60%RH max. If storage temperature is lower than operation temperature, jar must be completely thawed before opening. This product can be used after opening the jars without any preparation.

WLCSP封装 产品使用建议。

1. WLCSP 封装为了达到优良的电性和物理采用了裸Die的封装方式区别于常规的塑封料封装。该芯片在SMT 或者组装过程中需要注意物理碰撞，以及过高的应力发生。
2. 常规封装产品焊接时与基板相连接的部位是外露的框架引脚。WLCSP 是锡球焊接在PCB板上，焊接的回流焊曲线菜单设置，建议可以参考锡球材料回流焊建议曲线。
3. 封装厂芯片tape reel 站点使用吸嘴将芯片吸附并放进编带，参考尺寸如下。（如需要的，客户可参考）

芯片尺寸	吸嘴外径(mm)	吸嘴内径(mm)	吸力
0.67x0.67x0.425	0.76	0.35	<80cN
0.77x0.77x0.46	0.76	0.35	<80cN
0.97x0.97x0.55	0.76	0.35	<80cN
0.97x1.47x0.55	1.02	0.5	<80cN
1.27x1.27x0.55	1.02	0.5	<80cN
1.27x1.67x0.55	1.02	0.5	<80cN

总结：

使用WLCSP 封装产品，在获得其优良特性的同时需对该封装的芯片组装加工过程做相应的调整。

GLF始终致力提供给客户电性优良的产品，帮助客户解决问题并作改进。



Thank You

Jie Fu Microelectronics (Sichuan) Co., Ltd
15F, Tower B, JIC, No.669 Wan Xiang Nan Road, Hi-Tech District, Chengdu
Tel: 028-64109903