Wafer bumping-stencil

1.6

Laser cut stainless steel wafer bumping stencil

Application

High-accuracy laser cut stencils are a precise and cost-effective solution for depositing solder paste bumps directly to the wafer. The solder bumps are formed during the post-print reflow process. Strict control of the aperture diameter allows for precise solder paste volume deposition and bump height. Wafer bumping stencils are characterized by a high number of very close apertures in the size of 90 µm x 110 µm. Package density of 250 000 apertures is not uncommon. The material thickness of the stainless steel stencil foil is typically between 20 and 75 µm. In order to minimize the possibility of wafer damage due to minor variations in material thickness, all stencils are brushed on both sides with an ultrafine brush and the surface shows a roughness < 0.9 µm.

Because of the high package density and the very close apertures, the precision of the laser cut process and control of the positional accuracy is critical. The wafer bumping stencils from LaserJob guarantee optimal transferred solder paste volume due to tight tolerances of ± 3 µm in material thickness and ± 3 µm in aperture accuracy. By holding to these tight tolerances in material and production, LaserJob wafer bumping stencils show significant advantages over other manufacturer processes.

LaserJob has developed a special laser cut process which guarantees the highest precision and fulfills the most stringent demands of the component manufacturer.

Advantages

- high positional accuracy
- high aperture size accuracy ± 3 µm
- surface roughness < 0.9 µm

The stencils are produced in temperature-controlled production rooms with a fiber laser. The fiber laser generates a superior beam quality over traditional laser systems. The unique lower cutting opening (20 µm versus 40 µm), with an equal depth of focus sharpness, transmits much less heat into the material. At the same time, the edges are less coarse and the cut quality of every aperture is more accurate.
The high precision of the stencil is achieved with a special LaserJob cut algorithm which is employed on LaserJob's custom-built laser systems.

Stencil post-processing

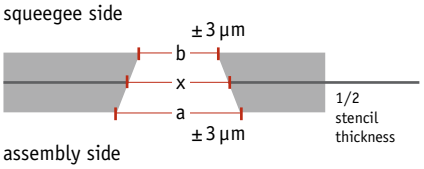
All laser cut stencils from LaserJob are subjected to an automated post-cut process. The CNC controlled brushing system moves all exposed burrs on the laser exit side. The brush head travels across the entire stencil surface in horizontal and vertical directions.

Advantages of this process

- No enlargement of pad openings
- Minimal loss of material (less than 2 mm)
- Consistent thickness of stainless steel material

Quality control

Quality assurance is paramount at LaserJob. Effective quality control starts with incoming inspection of the stainless steel sheets and stencil frames. A thickness measurement instrument controls every stainless steel sheet with an accuracy of ± 0.5 µm. The screen tension is measured from each screen printing frame. Directly after the laser cutting process, aperture size and aperture geometry are inspected. The OKM measurement system detects on an area of 400 mm x 200 mm with a precision of 0.5 µm + L/400 the position of the apertures. The contour of apertures is controlled with an accuracy of 0.5 µm with a CCD camera with back light. ScanCheckI+ compares the produced stencil with original data and examines the congruency.

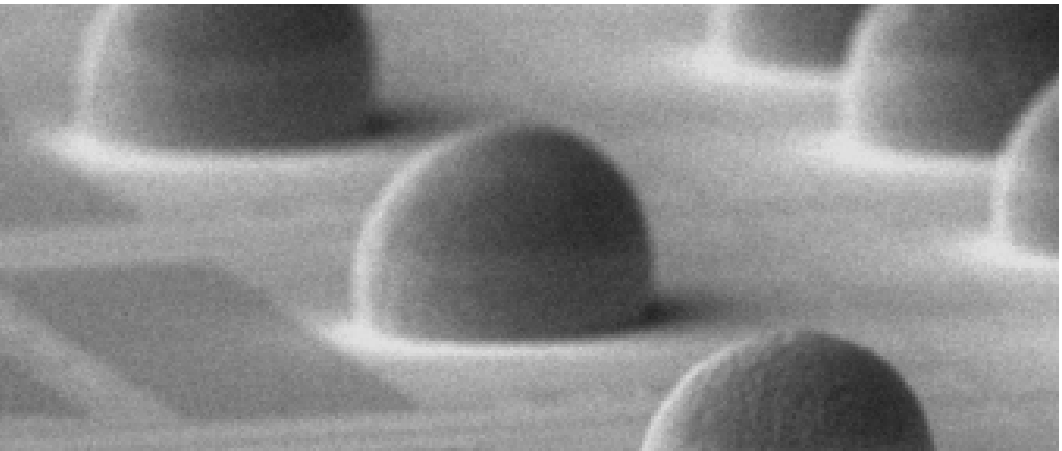


x = reference value

$$x = \frac{a + b}{2}$$

b = value measured by transmitted light
a = value measured by reflected light
a = b + ≤ 12 µm
a – b = ≤ 12 µm
b = x – ≤ 6 µm
a = x + ≤ 6 µm

Opening tolerances of a laser cut



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Fulfillment

The stainless steel material, which is utilized for the stencils, has an optimal hardness and tensile strength. Only stainless steel sheets with a nominal thickness variance are utilized.

Material
Stainless steel: 1.4301
Hardness (Hv): min 370
Tensile strength (N/mm²): > 1100
Thickness of stainless steel sheet: ± 3 %

Dimensions of stainless steel materials
SMD stencils are available in metal sheet thicknesses of (µm):
20, 30, 50, 70, 80, 90, 100, 120, 130, 140, 150, 180, 200, 250, 300, 400
Maximum thickness of metal sheets: 2 mm
Maximum machine surface: 800 mm x 600 mm

Variances
- NanoWork®-stencil
- PatchWork®-stencil (Step stencil)
- 3D PatchWork®-stencil
- combination PatchWork®-stencil with NanoWork®-coating
- stencil in screen printing frame glued over stainless steel mesh
- in tensioning system LJ 745
- in Quattroflex tensioning system
- in VectorGuard® tensioning system
- in Alpha Tetra/Micromount/Vector tensioning system
- in Zelflex tensioning system
- in Stencilman tensioning system
- in customer-specific tensioning system

Frames
- aluminum frames
- cast aluminum frames
- stainless steel frames

For more information on the sizes and types of available frames, please refer to data sheet 1.4 Frames and Tensioning systems

The stainless steel screen cloth, composed of 0.1 mm diameter wire woven into an 80 mesh array, is strong, durable, heat-resistant and resilient. Optional screen filler can be applied after tensioning in order to avoid contamination of the screen cloth and printer.

Service

LaserJob offers a full range of consulting services for layout and design. Our team generates, from your CAD-CAM data, automatic cutting instructions for the laser. Our highly focused laser systems cut with high positioning accuracy the apertures.

We offer additional
- scaling apertures up and down
- changing aperture design, e.g. home plates and rounding sharp corners
- optimizing apertures (anti tombstone design)
- rotating or mirroring of the whole design or sub-areas
- control of aspect and area ratios
- generation of stencils with multiple panels
- generating layouts from existing PCBs
- generating stencil layouts for adhesive applications
- customer-specific storage for used frames. The frames will be cleaned, re-strung and provided for new orders. Your actual inventory is always retrievable.
- data storage
- test certificates (as well as customer's specifications)
- data for solder paste inspection systems
- Data Matrix Code
- measuring of printed circuit boards
- production of stencils from provided PCBs, stencils, or films

Shipping conditions

Shipping time
Standard shipment time ex works is 3–5 work days
Order entry before 5 p.m. (= first work day)

Common carrier: UPS, DHL, GO, FedEX (any shipping service) as well as direct shipments with courier delivery with partner companies.

Packaging
All LaserJob stencils are shipped in reusable packaging. To avoid damage of stencils proven packaging materials are used. We deliver stencils in packaging as well on customer request.

Order process
To guarantee fast handling of your order, send the purchase order via

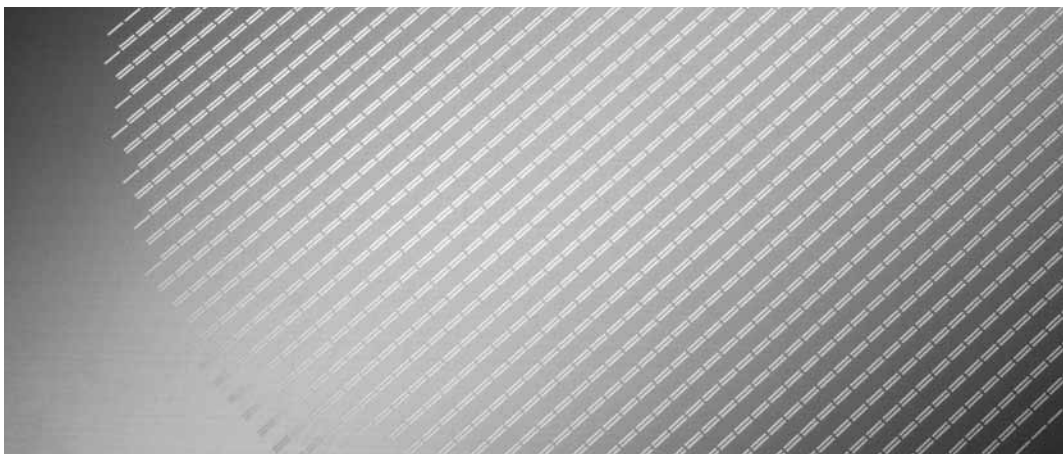
- e-Mail: **mail@laserjob.de**
- fax: **+49 (0) 8141 52778-60**
- post

Please send the gerber files for the stencils via e-mail to **mail@laserjob.de**

We are ISO 9001:2008 certified

LaserJob data sheets
1.0 SMD stencil
1.1 NanoWork® stencil
1.2 PatchWork® stencil
1.3 Tensioning system LJ 745
1.4 Frames and tensioning systems
1.5 Repair and Re-balling stencil
1.6 Wafer bumping-stencil
1.7 LTCC Via fill-stencil
2.0 Laser Material Processing
2.1 Laser ablation

Auch in Deutsch erhältlich.



As of 09/2013