Preliminary Surface Mount Application Notes for FusionQuad Package

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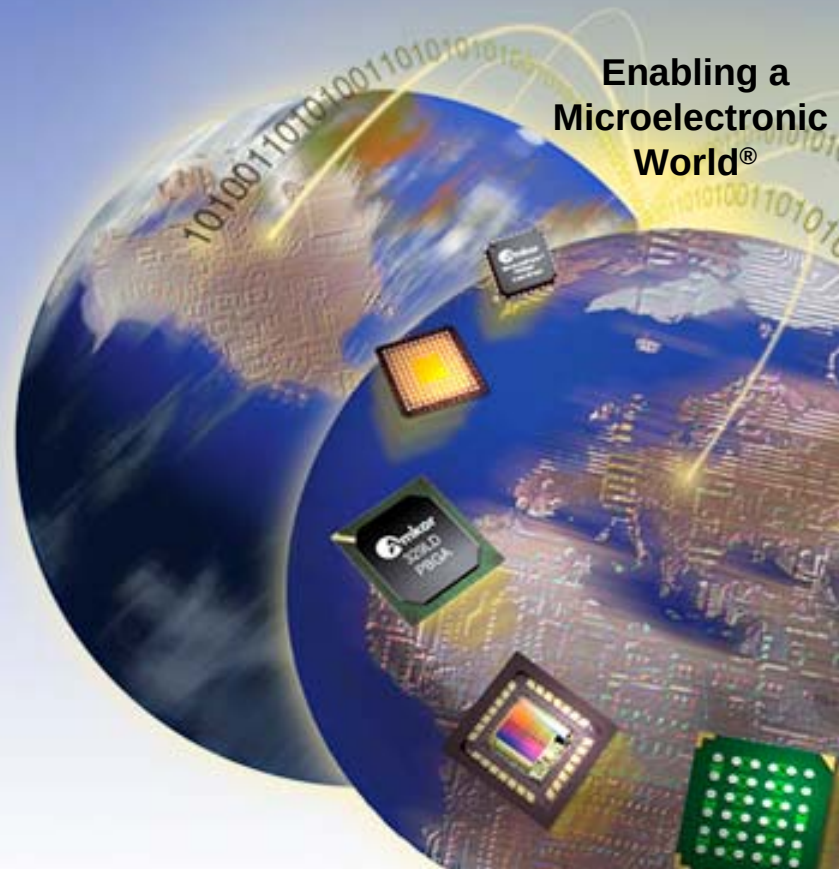


Amkor Technology®

FusionQuad Portfolio (Preliminary)

Body size (mm)		24x24	20x20	16x16	14x14	12x12	10x10
Std TQFP 0.4mm pitch Pin Number		216	176	144	128	100	80
Std TQFP 0.5mm pitch Pin Number		176	144	120	100	80	64
FusionQuad Single Row 0.5	+Fusion Pin	112	112	84	64	52	36
	Total pin	288	256	204	164	132	100
	max pad (mm)	15	15	11	9	7	5
	max die size	13.5	13.5	9.5	8	6	4
FusionQuad Dual Row 0.5	+Fusion Pin	200	200	140	116	76	52
	Total pin	376	344	260	216	156	116
	max pad (mm)	14	14	10	8	6	4
	max die size	12.5	12.5	8.5	7	5	3

Note: Above are estimates only - Detailed designs have not yet been implemented for all options

10 mm

12 mm
128 ld

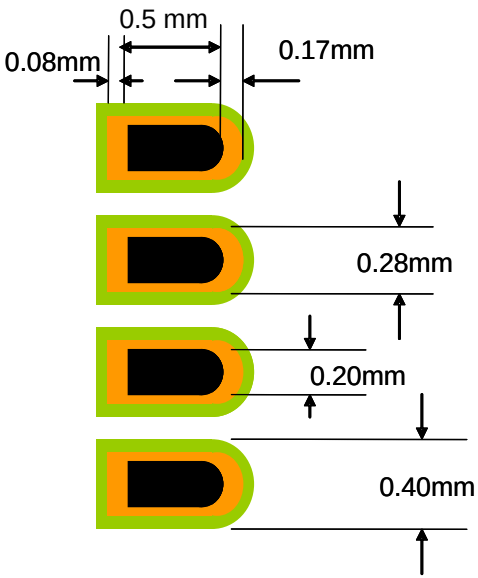
14 mm

16 mm
208 ld

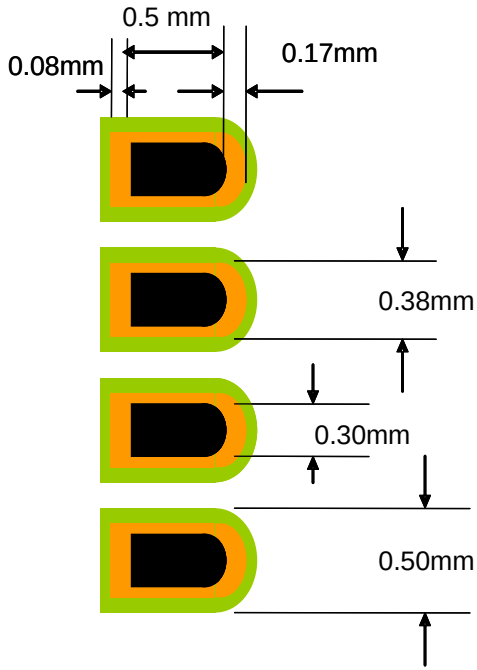
20 mm 256 ld

Board Land Pattern Design

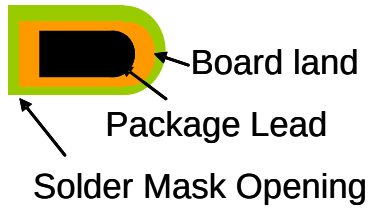
- **Gull Wing Leads**
  - Follow IPC-7351guideline (Land pattern design for QFPs)
- **Single Row Fusion Leads (Non isolation saw type)**
  - Follow Single Row MLF guideline by Amkor (MLF Application Notes)
  - Lead length is 0.5mm, same to single row MLF land geometry



Typical 0.5 pitch Single Row

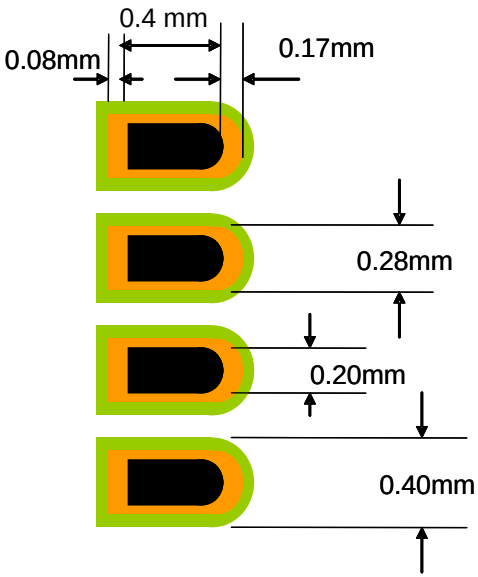


Typical 0.65 pitch Single Row

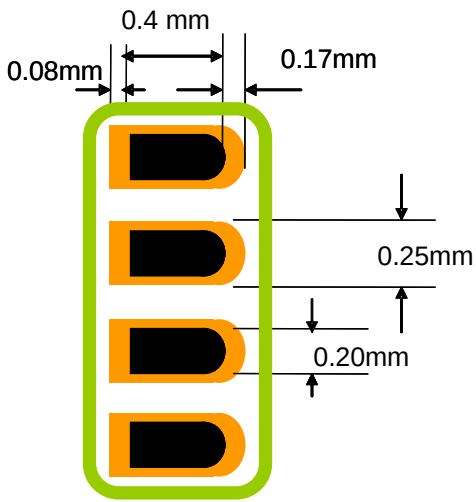


Board Land Pattern Design

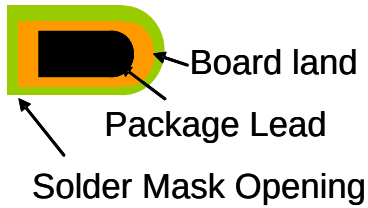
- **Gull Wing Leads**
  - Follow IPC-7351guideline (Land pattern design for QFPs)
- **Single Row Fusion Leads (Isolation saw type)**
  - Follow Single Row MLF guideline by Amkor (MLF Application Notes)
  - Lead length is 0.4mm nominal, same as dual row MLF land geometry



Typical 0.5 pitch Single Row

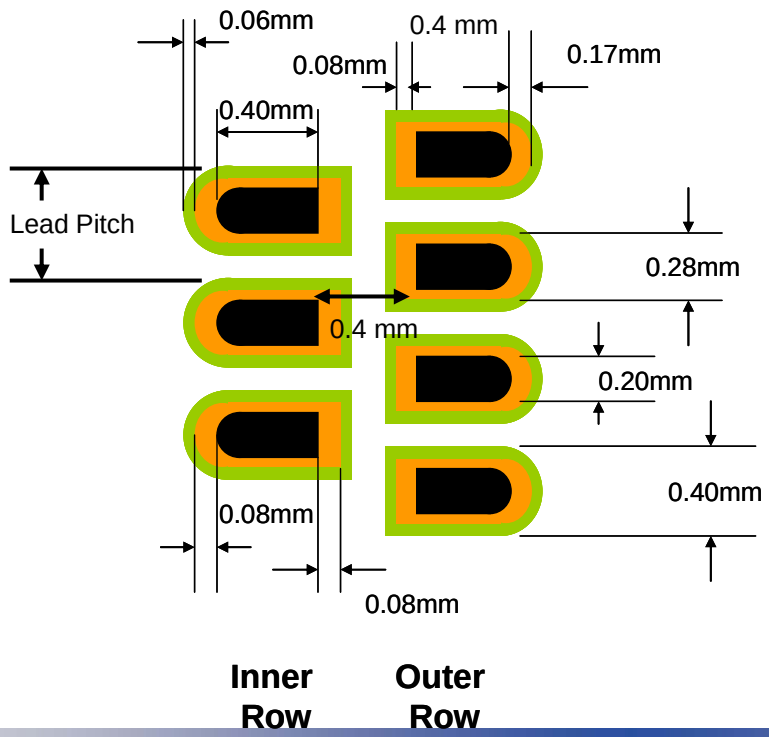


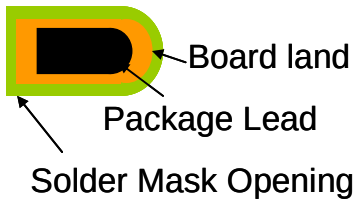
Typical 0.4 pitch Single Row



Board Land Pattern Design

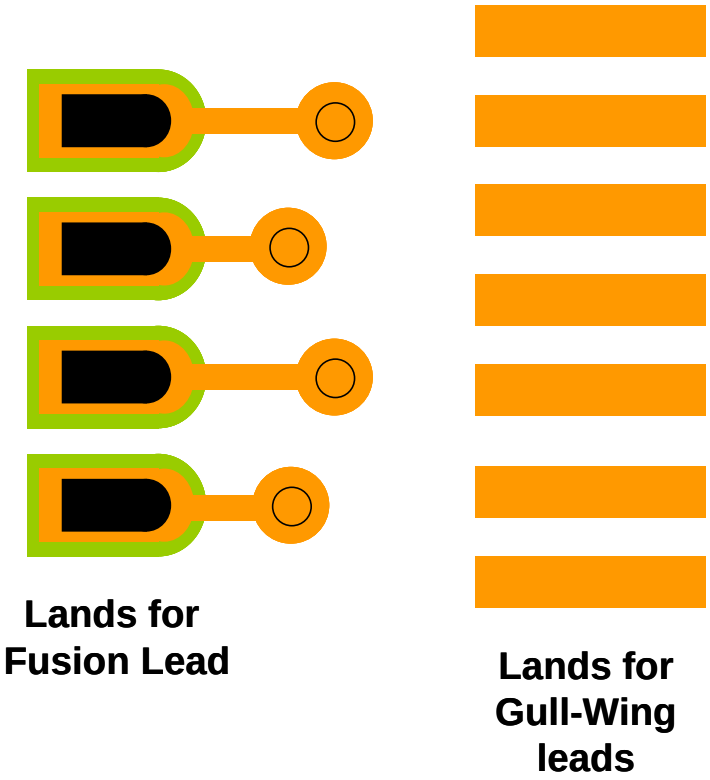
- **Gull Wing Leads**
  - Follow IPC-7351guideline (Land pattern design for QFPs)
- **DualRow Fusion Leads (0.5/ 0.60/ 0.65mm pitch, isolation saw)**
  - Lead length is 0.4mm nominal, same as dualrow MLF land geometry





Escape Routing Options for Fusion Leads

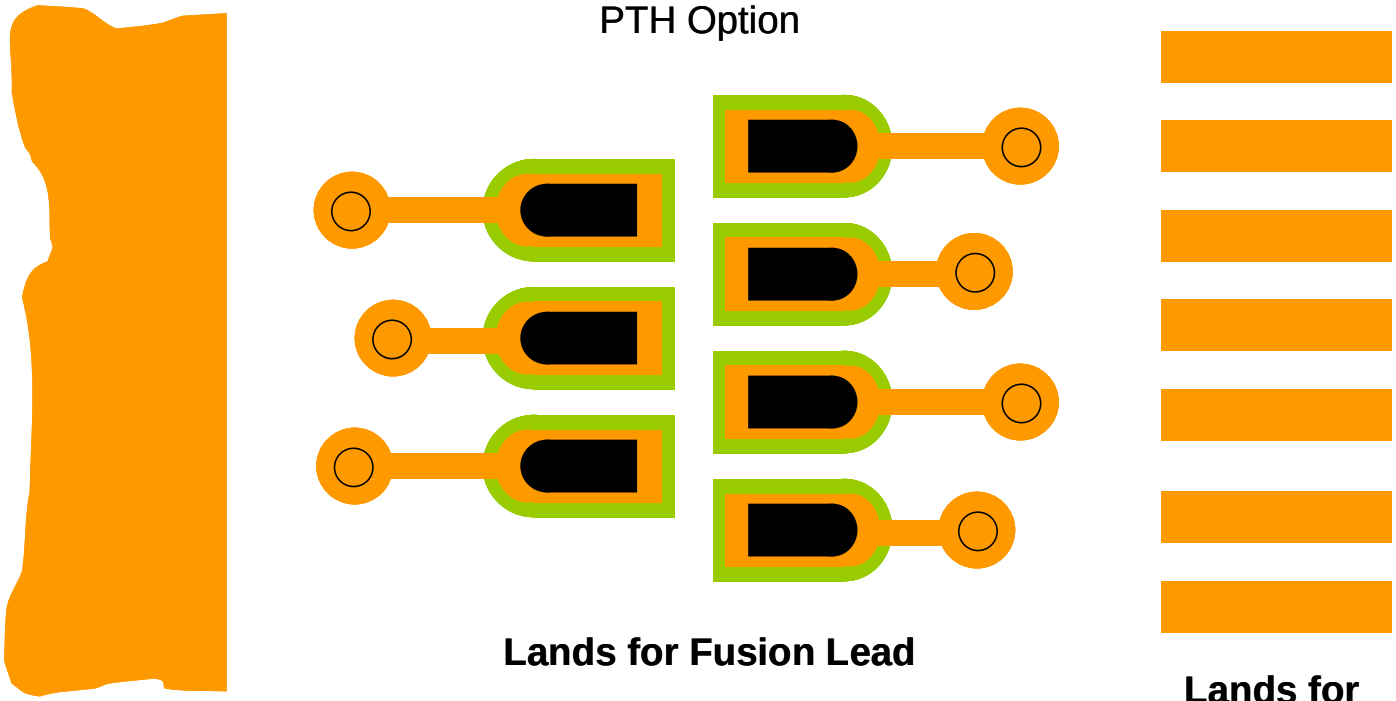
- **Escape routing using PTH**
  - Standard technology boards – no microvias



Escape Routing Options for Fusion Leads

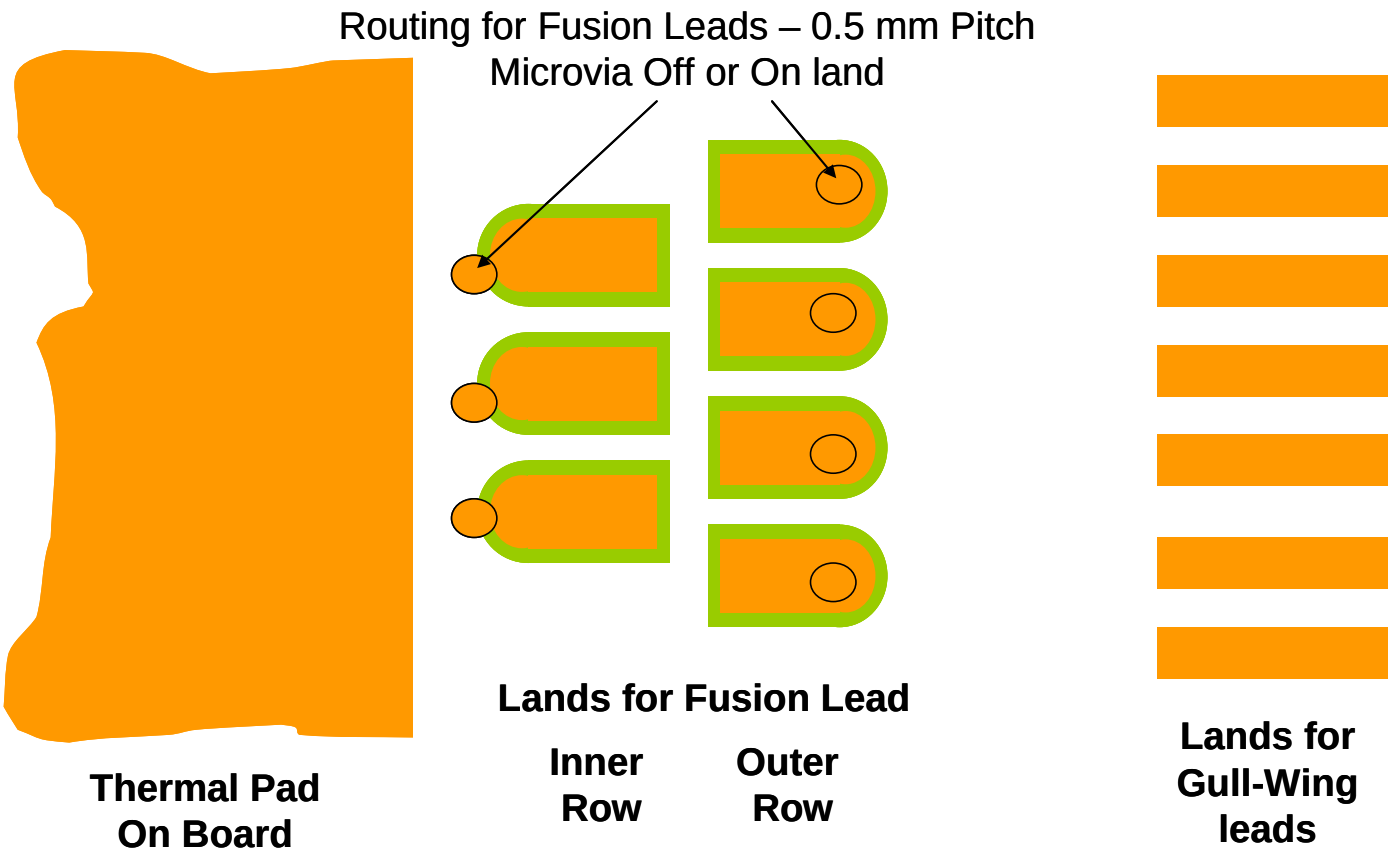
- **Inner/outer lead routing using PTH (0.5mm inner lead pitch)**
  - Thermal pad size on board need to be reduced > lower thermal performance
  - Standard technology boards – no microvias

Routing for Fusion Leads – 0.5mm pitch
PTH Option



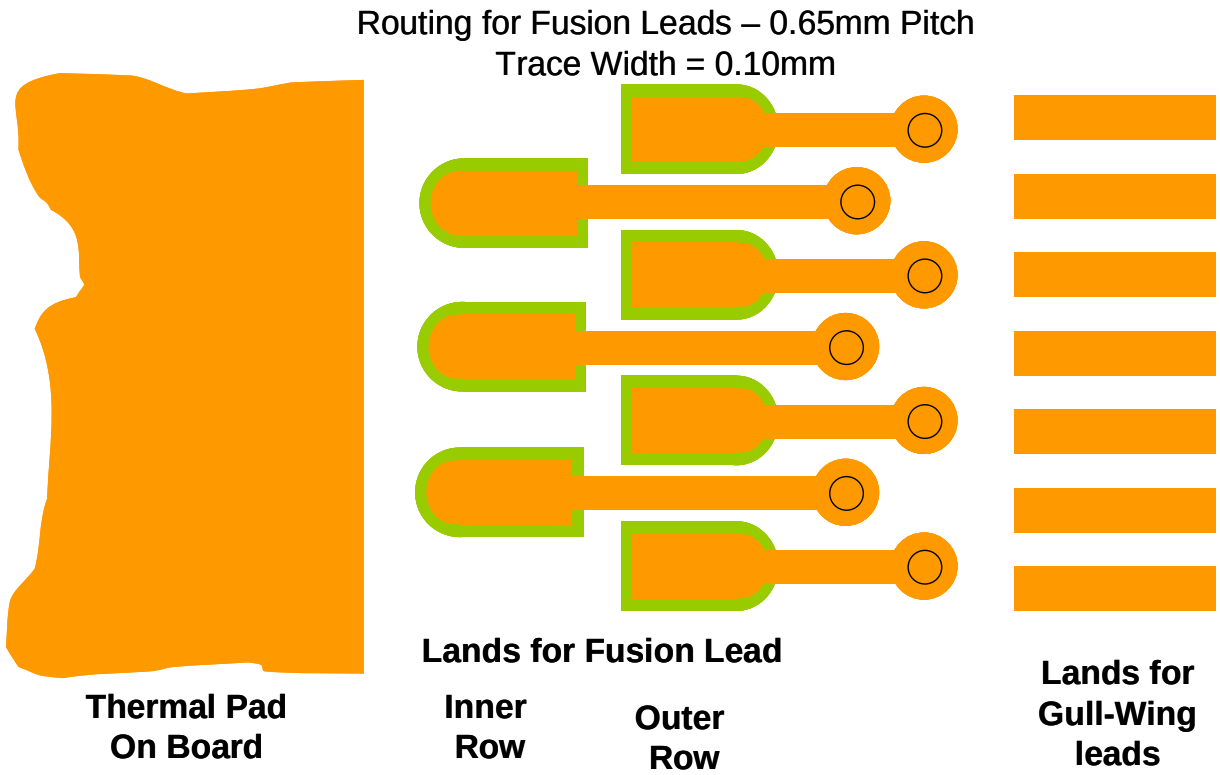
Escape Routing Options for Fusion Leads

- **Inner/outer lead routing - microvias (0.5mm inner lead pitch)**
  - Thermal pad size on board can be same as exposed pad on package
  - Requires microvia technology board > number of layers need to be increased



Escape Routing Options for Fusion Leads

- **Inner/outer lead routing using PTH**
  - 0.60 and/or larger pitch dual row fusion leads
  - Escape routing between Fusion and QFP leads
  - No thermal pad size reduction required
  - Standard technology boards – no microvias



Surface Mount Guidelines

IPC-A-610D Class 2 Acceptance Criteria

- Soldering Acceptability Requirements specified in IPC-A-610D Section 5.1
- Soldering Anomalies described in IPC-A-610D Section 5.2
- Requirements specified in IPC-A-610D Section 8.2.5 for Gull Wing Leads.
- Requirements specified in IPC-A-610D Section 8.2.13 for Plastic QFNs.

Solder Joint Standoff Height Requirements

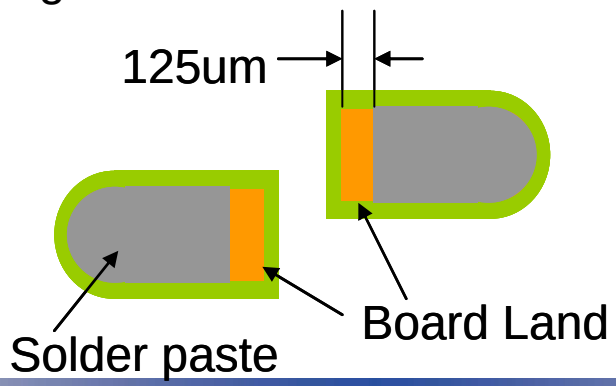
- Minimum Solder Joint Standoff Height of 50 um [2.0 mils] for MLF Leads.

Voiding Acceptance Criteria

- Maximum 50% voiding (of the Pad area) on the Center DAP Solder Joint.
- Maximum 25% voiding (of the Pad area) on the Peripheral MLF & QFP solder joints.

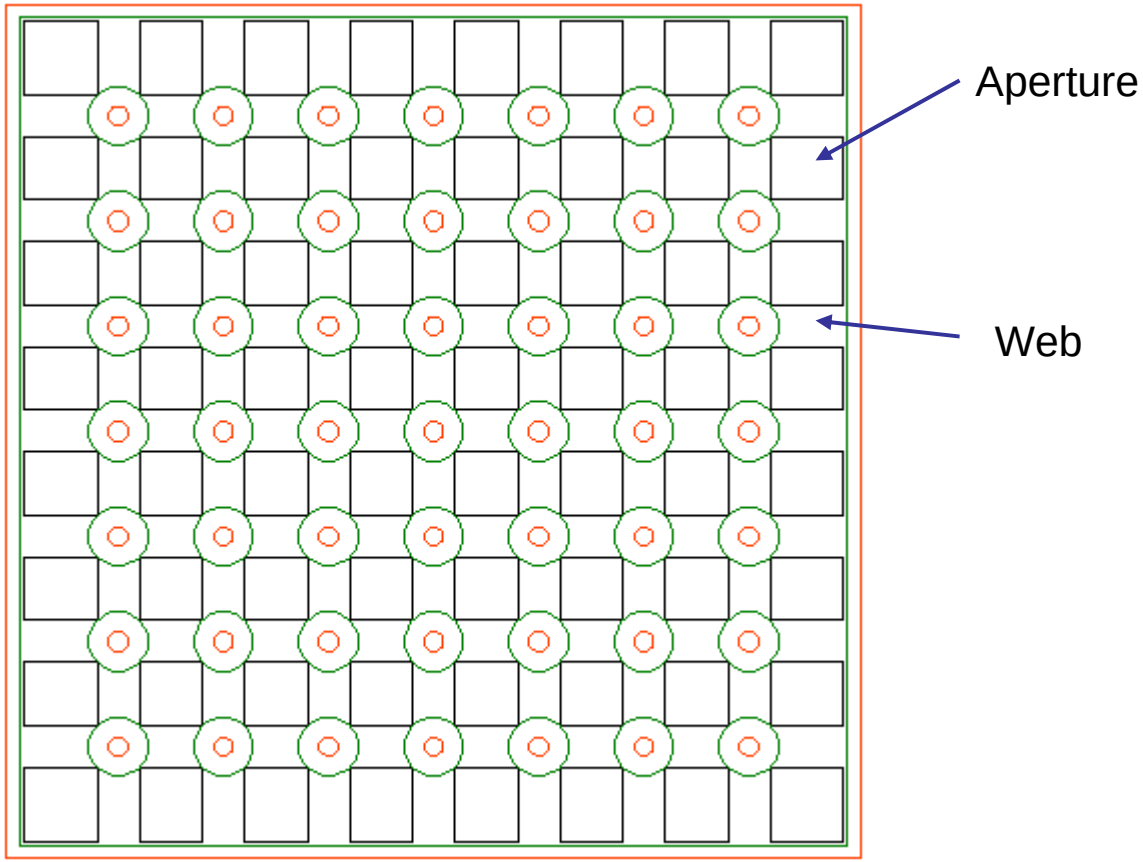
Surface Mount Guidelines

- **Stencil**
  - Laser-cut Electro-polished
  - Stencil Thickness: 100 to 125um
  - Apertures
    - QFP leads
      - Aperture same size as QFP lands on board
    - Single Row Fusion Leads
      - Aperture same size as Fusion Lead Lands on board
    - Dual Row Fusion Leads
      - Aperture reduced by 125um or 75% of Land length to avoid bridging between two rows of leads



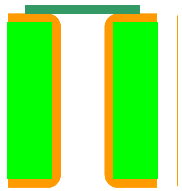
Surface Mount Guidelines

- **Stencil**
  - Example of stencil design for thermal pad

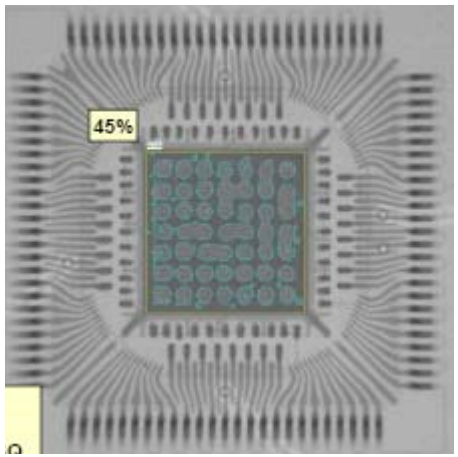


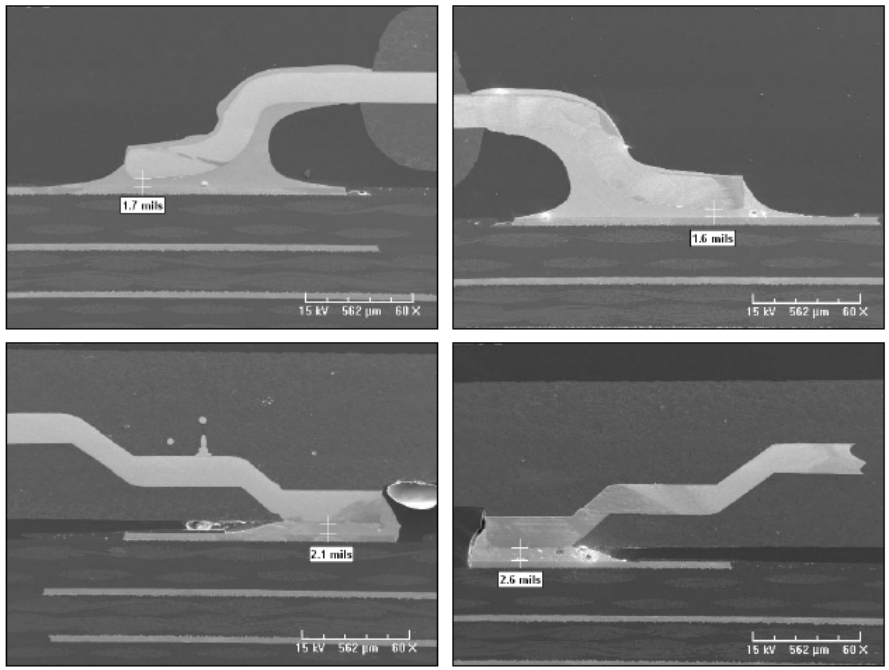
Surface Mount Guidelines

- **Paste coverage for Thermal Pad**
  - Thermal via **tented** from **top** (package mounted on the top side)
  - Desirable conditions for paste coverage
    - 100 um thick stencil
    - 50% paste coverage



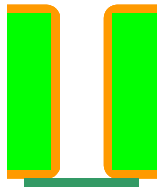
- 50um solder standoff for Fusion Leads
- Good joints with Gull-Wing Leads
- No Package tilt



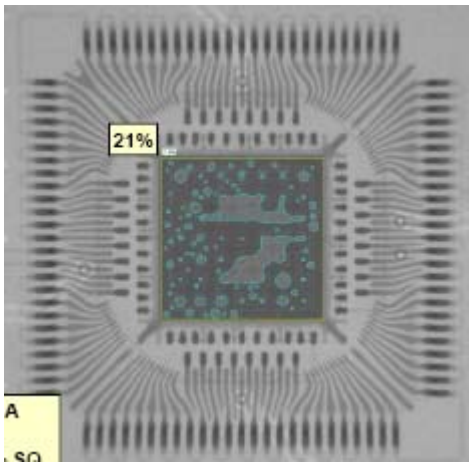


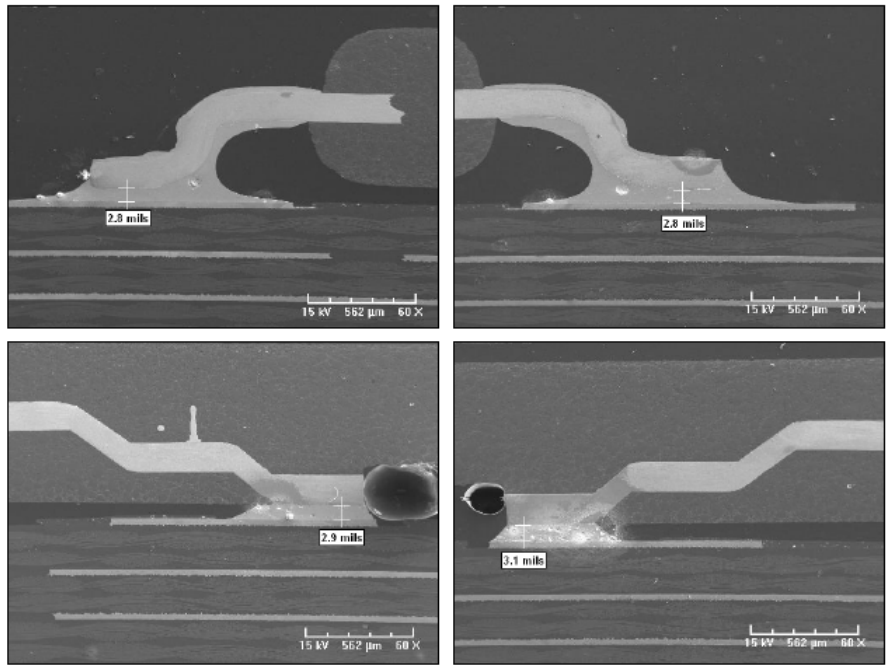
Surface Mount Guidelines

- **Paste coverage for Thermal Pad**
  - Thermal via **tented** from **bottom** (package mounted on the top side)
  - Desirable conditions for paste coverage
    - 100 um thick stencil
    - 65% paste coverage



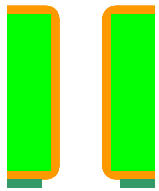
- > 50um solder standoff for Fusion Leads
- Good joints with Gull-Wing Leads
- No Package tilt

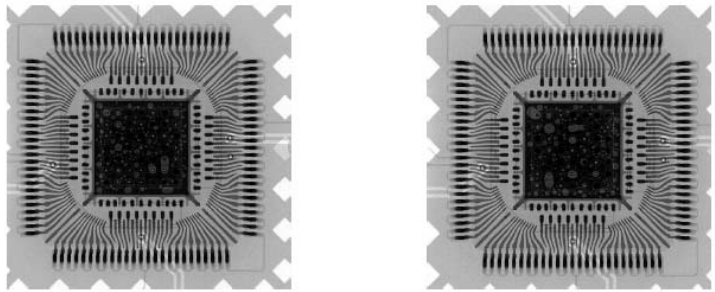




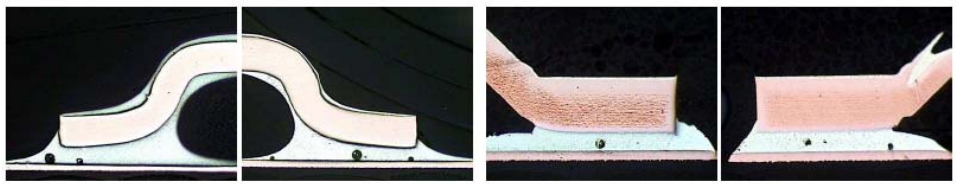
Surface Mount Guidelines

- **Paste coverage for Thermal Pad**
  - Thermal via **encroached** from **bottom** (package mounted on the top side)
  - Desirable conditions for paste coverage
    - 100 um thick stencil
    - 80% paste coverage





X-ray pictures after reflow



Rework Guidelines
Courtesy: OK International

- **Package removal – standard process**
- **Board Site clean-up – standard process**
- **Paste printing on replacement package**
  - Fusion leads only
- **Flip package on board**
- **Reflow**
- **Hand solder QFP leads**