Macronix 209mil 8-SOP and 6x5mm 8-WSON Dual Layout

1. Introduction

In general, one application will use a single package type for each chip in their design. However, some applications may consider using a "dual layout" to accommodate different package types within the same PCB (printed circuit board) footprint. The Macronix MX25L3206E 32Mb serial flash will be used in this application note as a vehicle to discuss the creation of a dual PCB footprint layout. Macronix provides the MX25L3206E in a variety of packages.

- 209mil 8-SOP
- 300mil 16-SOP
- 300mil 8-PDIP

- 6x5mm 8-WSON
- 4x4mm 8-USON
- 6X8mm 24-TFBGA (5x5 ball array)

Because the 209mil 8-SOP and 6x5mm 8-WSON packages both have the same pin definitions, we will create a "dual layout" PCB footprint using these two package types. This document may be used as a general reference guideline by any designer needing a layout that will support the 209mil 8-SOP and 6x5mm 8-WSON packages. These packages are used for the Macronix 32Mb serial flash, as well as the 4Mb (MX25L4006E), 8Mb (MX25L8006E), and 16Mb (MX25L1606E) densities as well.

2. Package Dimension Comparison

Although both packages have similar footprints and package sizes, the designer doing a dual layout needs to provide clearance for the larger package and adjust the PCB pad size to provide sufficient pad metal for soldering either package type. Table 2-1 compares package outline and pin dimensions for the 209mil 8-SOP and 6x5mm 8-WSON.

Package Dimension	209mil 8-SOP (mm)	6x5mm 8-WSON (mm)
Package Body Length (max)	5.33	5.10
Package Body Width (max)	5.38	6.10
Package Body Width (min)	5.18	5.90
Package Width + Leads (max)	8.10	6.10
Lead Width (max)	0.51	0.48
Lead Length contact area (max)	0.80	0.75
Lead Pitch	1.27	1.27

Table 2-1: Package Outline Dimensions.

Figure 2-1 illustrates the dimensions of the 209mil 8-SOP and 6x5mm 8-WSON packages. The designer needs to consider package size, pad position, and PCB pad size during PCB layout.
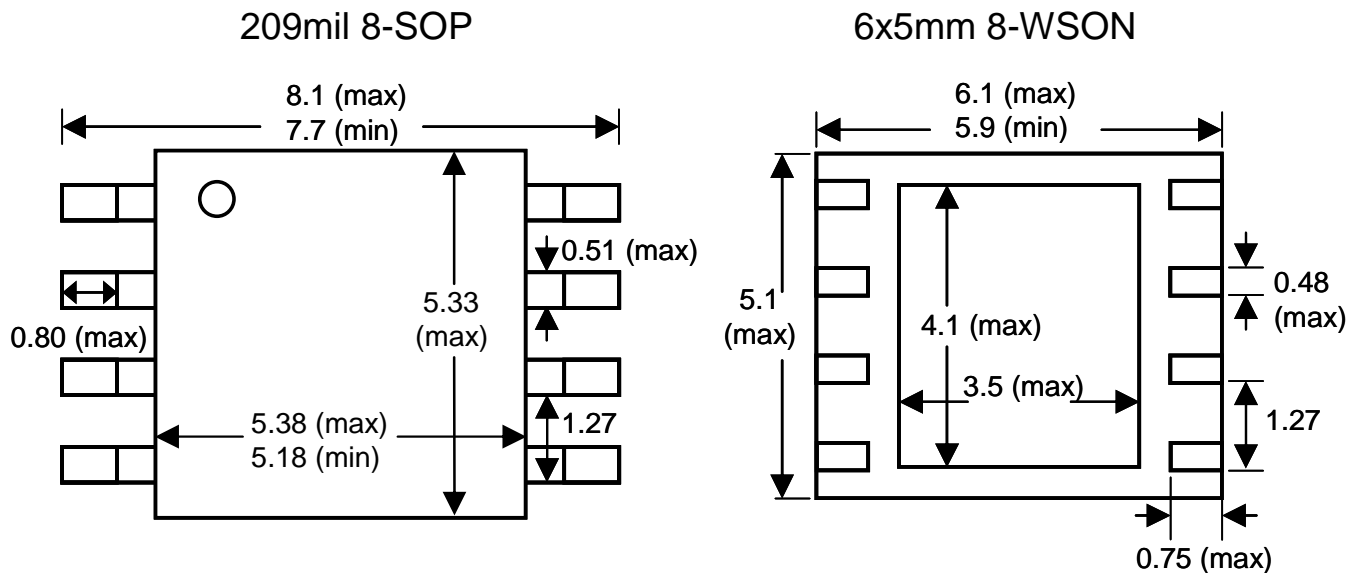
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209mil 8-SOP
6x5mm 8-WSON

Figure 2-1: 209mil 8-SOP and 6x5mm 8-WSON Package Dimensions (in mm.)

3. PCB Layout Recommendation

Conceptually, the steps required to determine the final "dual layout" PCB footprint are trivial. We only need to determine the minimum footprint required for each package individually, and then simply create a composite using the image of the two footprints. A breakdown of the steps follows.

First, determine the minimum required PCB footprint for each package. The minimum size is targeted so as to reduce the final PCB size and cost. If the solder pad size for each package is not readily available, the package and lead dimensions can be used to calculate the PCB solder pad sizes. The package dimensions can be found in the Package Information section of the Macronix datasheet. As a rough guideline, use the "worst case" or "maximum/minimum" values where applicable in your calculation, rather than "nominal" values. For example, we used maximum lead lengths instead of nominal to ensure pad sizes can accommodate all package size variations. To improve mechanical strength between the package and the PCB, in the example which follows, the solder pads were extended 0.35mm beyond the toe of each lead. This was done so that the solder joint is larger and the solder is able to wick up the toe of the lead, not just contact the bottom. The 3.5mm x 4.1mm center solder pad was determined by the maximum size of the exposed metal of the 8-WSON package.

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Now all that remains is to merge the two solder pad footprints created into one final composite pad layout diagram, similar to the one shown in Figure 3-1. In our specific example of the Macronix MX25L3206E 209mil 8-SOP and 6X5mm 8-WSON dual layout, a 5.33mm x 8.8mm layout area is used with pad lengths of 2.45mm to accommodate both packages in the same PCB footprint.

Composite Pad Layout Calculations:
  1) Minimum Composite Layout Area:
     Length   = Larger of two packages (8-SOP) = 5.33mm
     Width   = Larger of two packages (8-SOP) + (2 x lead extensions) = 8.1 + 0.35 + 0.35 = 8.8mm

  2) Minimum heel-to-heel Pad Space:
               = WSON Center Pad + (2 x min Metal Pad to Pad Separation) = 3.5 + 0.20 + 0.20
               = 3.9mm

  3) Minimum Solder Pad Size:
     Length   = (Maximum Layout Width - Minimum heel-to-heel Pad Space)/2 = (8.8 – 3.9) / 2
               = 2.45mm
     Width   = Larger (8-SOP) + (2 x lead side extensions) = 0.51 + 0.03 +0.03 = 0.57mm
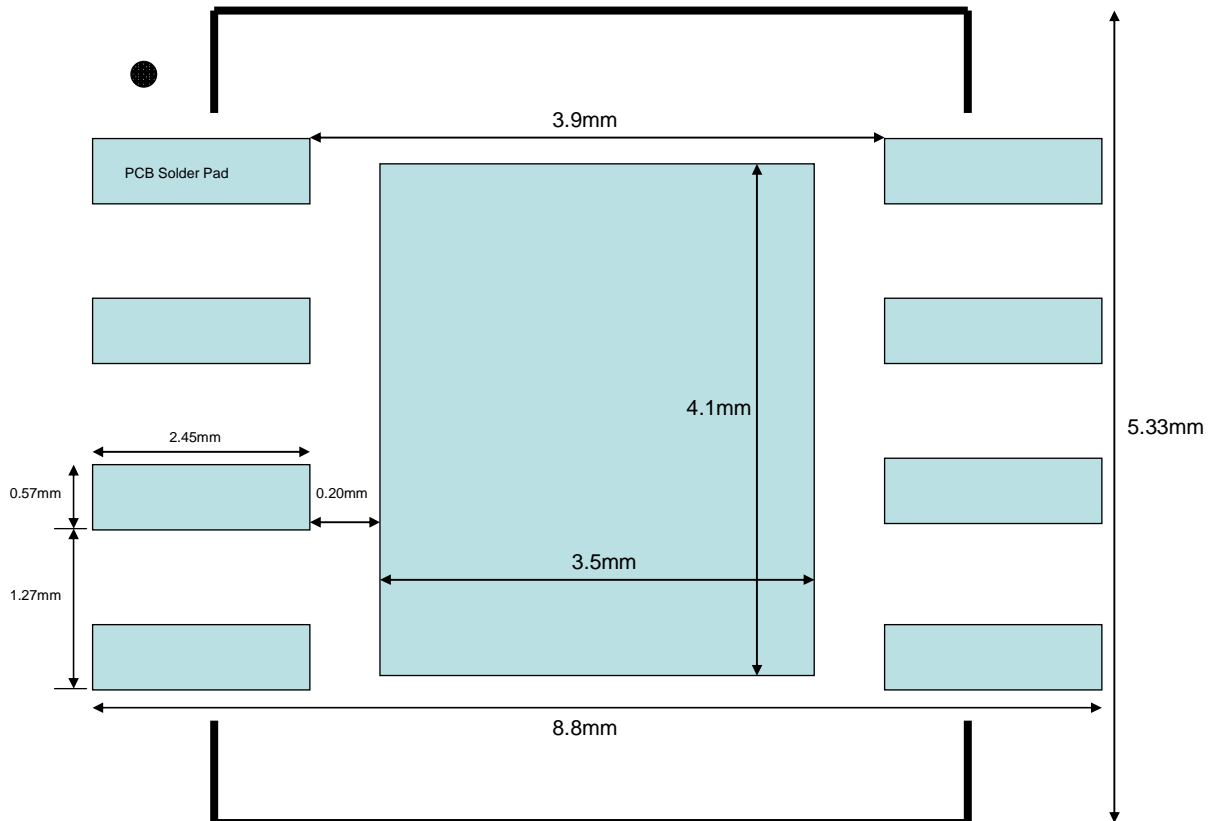   Pitch   = 1.27mm (Same for both packages)

Figure 3-1: Dual Layout PCB Footprint for the 209mil 8-SOP and 6x5mm 8-WSON Packages.

4. Summary

The Macronix MX25L3206E 32Mb serial flash was used to create a dual PCB footprint layout which could be used to mount either the 209mil 8-SOP or the 6x5mm 8-WSON package. These packages are used for not only the Macronix 32Mb serial flash, but for the 4Mb (MX25L4006E), 8Mb (MX25L8006E), and 16Mb (MX25L1606E) densities as well. While doing a dual layout design, the designer may use this application note as a reference. The corresponding datasheets should also be referenced to obtain current package dimensions and can be found on the Macronix Website at http://www.macronix.com.

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For the contact and order information, please visit Macronix's Web site at: http://www.macronix.com