

Analysis of Molten Solder

Process of reflow soldering is analyzed using SC/Tetra

Case study: Analysis of Molten Solder

Analysis Model

Solder cream is applied to the two lands on the board. A rectangular chip resistor is attached.

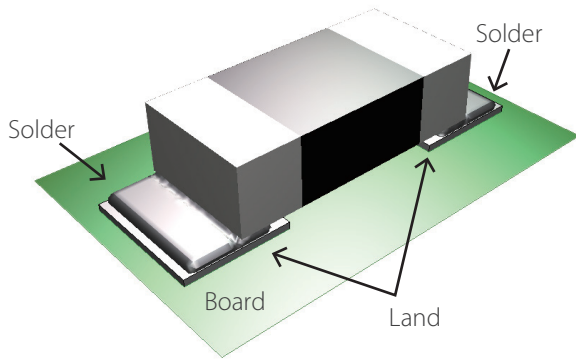


Figure 1: 0402-size chip resistor

Chip resistor	Length 0.4 mm Width 0.2 mm
Viscosity of molten solder	Variable ~ 0.020 ~ 100 Pa·s to express melting
Density of molten solder	8,000 kg/m ³
Surface tension	0.40 N/m
Contact angle with land and chip resistor	30°

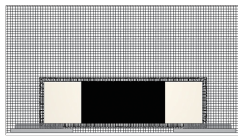
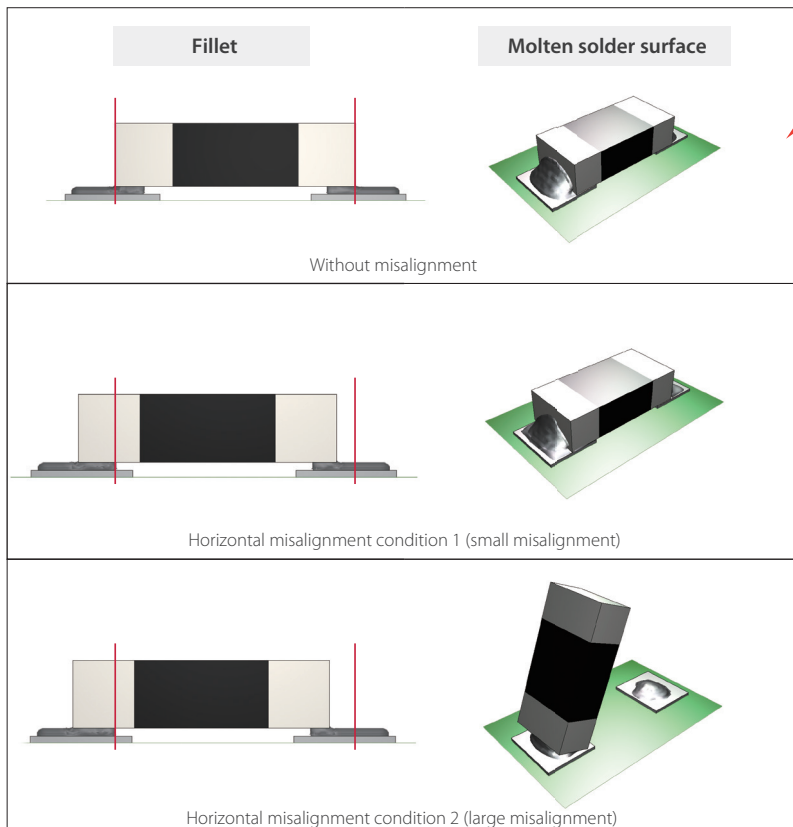


Figure 2: Overset mesh

- Overset mesh is used in the moving overlap region that surrounds the chip resistor and each element in the static region.
- Motion of the chip resistor is given 6DOF (6 degree of freedom). The chip resistor translates and rotates with consideration on the force from molten solder by solving the equations of motion.

Analysis Results



Formation of molten solder surface fillets are well simulated at both ends of the chip resistor

Notes

From the result of horizontal misalignment condition 1 in Figure 3, slight horizontal misalignment does not affect the formation of the solder fillets. The phenomenon that causes electronic parts to stand as in the result of horizontal misalignment condition 2 is called the Manhattan phenomenon, likened to the high-rises in New York City.

Figure 3: Molten solder analysis results (without misalignment [top], horizontal misalignment condition 1 [middle], horizontal misalignment condition 2 [bottom])