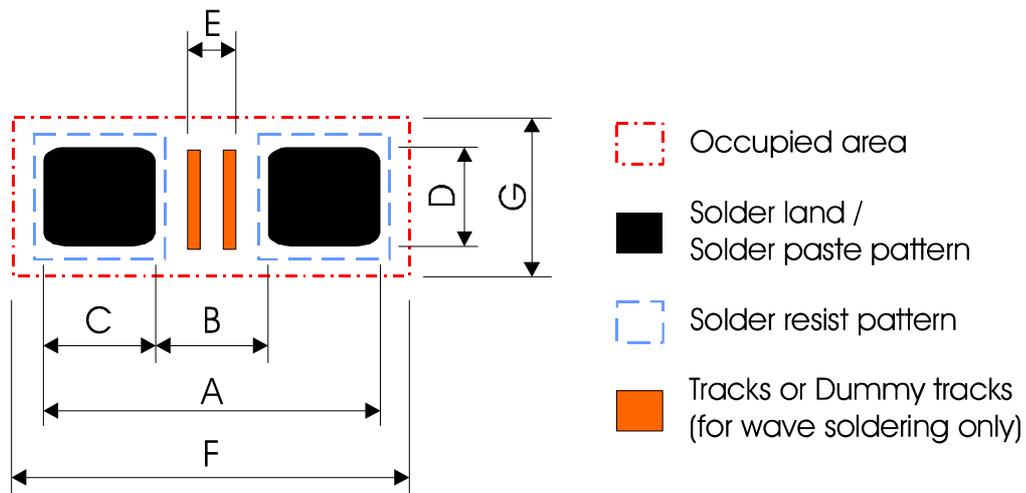


Guidelines for Footprint Design

The first step in circuit board design is to consider **how the surface mounted board will be manufactured**. This is because the manufacturing process determines the necessary dimensions of the solder lands, the minimum spacing between components, the area underneath the SMD where tracks may be laid down, and the required component orientation during wave soldering. Therefore a footprint related to the manufacturing process with all this information is an essential tool for SMD circuit board design.

A typical SMD footprint, as shown in following figure is composed of :



These footprint details depend on the following parameters :

- Component dimensions and tolerances as given in the component data ;
- Board dimensional accuracy ;
- Placement accuracy of the component with respect to the solder lands on the board ;
- Solder paste position tolerances with respect to the solder lands (for reflow soldering only) ;
- The soldering process parameters ;
- Solder resist position tolerances with respect to the solder lands ;
- Solder joint parameters for reliable joints.

■ Footprint design for discrete CHIP-R

◆ Reflow Soldering

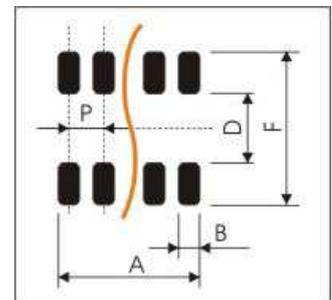
SIZE	Footprint dimensions in mm							Processing remarks	Placement Accuracy
	A	B	C	D	E	F	G		
0201	0.75	0.30	0.30	0.30	0.20	1.10	0.50	IR reflow soldering	± 0.05
0402	1.50	0.50	0.50	0.60	0.10	1.90	1.00	IR or hot plate soldering	± 0.15
0603	2.10	0.90	0.60	0.90	0.50	2.35	1.45		± 0.25
0805	2.60	1.20	0.70	1.30	0.75	2.85	1.90		± 0.25
1206	3.80	2.00	0.90	1.60	1.60	4.05	2.25		± 0.25
1218	3.80	2.00	0.90	4.80	1.40	4.20	5.50		± 0.25
2010	5.60	3.80	0.90	2.80	3.40	5.85	3.15		± 0.25
2512	7.00	3.80	1.60	3.50	3.40	7.25	3.85	± 0.25	

◆ Wave Soldering

SIZE	Footprint dimensions in mm							Proposed number & Dimensions of dummy tracks	Placement Accuracy
	A	B	C	D	E	F	G		
0603	2.70	0.90	0.90	0.80	0.15	3.40	1.90	1x (0.15x0.80)	± 0.25
0805	3.40	1.30	1.05	1.30	0.20	4.30	2.70	1x (0.20x1.30)	± 0.25
1206	4.80	2.30	1.25	1.70	1.25	5.90	3.20	3x (0.25x1.70)	± 0.25
1218	4.80	2.30	1.25	4.80	1.30	5.90	5.60	3x (0.25x4.80)	± 0.25
2010	6.30	3.50	1.40	2.50	3.00	7.00	3.60	3x (0.75x2.50)	± 0.25
2512	8.50	4.50	2.00	3.20	3.00	9.00	4.30	3x (1.00x3.20)	± 0.25

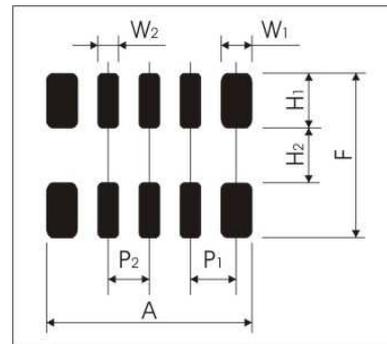
■ Footprint design for Array Resistor :

Type	0603*4	0402*4	0402*2
Symbol / Item	WA06X / WA06T	WA04X	WA04Y, WA04P
A	2.85 +0.10/-0.05	1.80 +0.15/-0.05	1.20 ± 0.05
B	0.45 ± 0.05	0.30 ± 0.05	0.40 +0/-0.05
D	0.80 ± 0.10	0.50 ± 0.1	0.50 ± 0.05
P	0.80	0.50	0.65
F	3.10 ± 0.30	2.00 +0.40/-0.20	1.50 +0.20/-0.10



■ Footprint design for 10P8R Network Resistor :

Symbol	WT04X
W_1	0.35 ± 0.05
W_2	0.50 ± 0.05
H_2	0.80 ± 0.10
P_1	0.70 ± 0.05
P_2	0.65 ± 0.05
A	3.20 ± 0.10
F	$2.80 +0.40/-0.20$



■ Footprint design for discrete MLCC :

◆ Reflow Soldering

SIZE	Footprint dimensions in mm							Processing remarks	Placement Accuracy
	A	B	C	D	E	F	G		
0402	1.50	0.50	0.50	0.50	0.10	1.75	0.95	IR or hot plate soldering	± 0.15
0508	2.50	0.50	1.00	2.00	0.15	2.90	2.40		± 0.20
0603	2.30	0.70	0.80	0.80	0.20	2.55	1.40		± 0.25
0612	2.80	0.80	1.00	3.20	0.20	3.08	3.85		± 0.25
0805	2.80	1.00	0.90	1.30	0.40	3.08	1.85		± 0.25
1206	4.00	2.20	0.90	1.60	1.60	4.25	2.25		± 0.25
1210	4.00	2.20	0.90	2.50	1.60	4.25	3.15		± 0.25
1808	5.40	3.30	1.05	2.30	2.70	5.80	2.90		± 0.25
1812	5.30	3.50	0.90	3.80	3.00	5.55	4.05		± 0.25
2220	6.50	4.70	0.90	5.60	4.20	6.75	5.85		± 0.25

◆ Wave Soldering

SIZE	Footprint dimensions in mm							Proposed number & Dimensions of dummy tracks	Placement Accuracy
	A	B	C	D	E	F	G		
0603	2.40	1.00	0.70	0.80	0.20	3.10	1.90	1x (0.20x0.80)	± 0.10
0805	3.20	1.40	0.90	1.30	0.36	4.10	2.50	1x (0.30x1.30)	± 0.15
1206	4.80	2.30	1.25	1.70	1.25	5.90	3.20	3x (0.25x1.70)	± 0.25
1210	5.30	2.30	1.50	2.60	1.25	6.30	4.20	3x (0.25x2.60)	± 0.25

■ Stencil thickness

The following relation between the solder land dimensions (C x D) and the solder paste apertures dimensions must be taken into account of solder for each solder joint :

Solder land dimensions	Solder paste apertures	Max. Stencil thickness
$C \geq 0.6$ & $D \geq 0.6$ $0.4 \leq C < 0.6$ & $D > 0.9$ $C > 0.9$ & $0.4 \leq D < 0.6$	$(C - 0.1) \times (D - 0.1)$	0.20 mm
$0.4 \leq C < 0.6$ & $0.6 \leq D \leq 0.9$	$C \times (D - 0.1)$	0.20 mm
$0.6 \leq D \leq 0.9$ & $0.4 \leq D < 0.6$	$(C - 0.1) \times D$	0.20 mm
$0.5 \leq D < 0.6$ & $0.5 \leq D < 0.6$	$C \times D$	0.20 mm
$C < 0.4$ & $D > 0.6$	$(D - 0.03) \times (C - 0.1)$	0.15 mm
$C < 0.4$ & $D \leq 0.6$	$(D - 0.03) \times (C - 0.05)$	0.12 mm