

System-On-Module (SOM) Assembly and Storage Guidelines



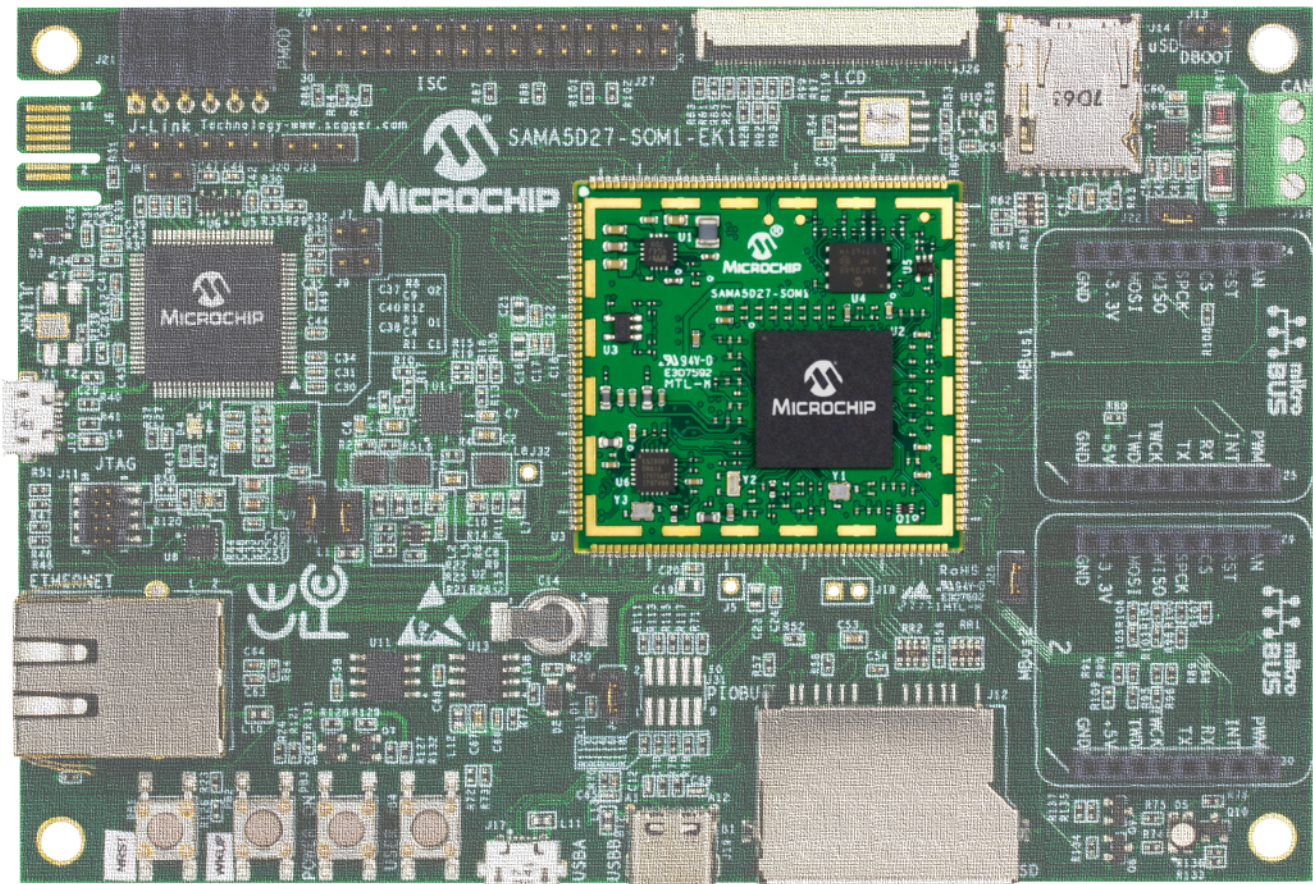
AN5249

www.microchip.com Product Pages: [ATSAMA5D27-SOM1](#), [ATSAMA5D27-WLSOM1](#), [SAM9X60D1G](#), [SAM9X75D1G](#), [SAM9X75D2G](#), [SAMA7D65D1G](#), [SAMA7D65D2G](#), [SAMA7G54D1G](#), [SAMA7G54D2G](#)

Introduction

Microchip System-On-Modules (SOMs) are mounted on a carrier board in the same way as other SMT components.

The goal of this application note is to define design and manufacturing specifications to ensure proper assembly of the Microchip SOM on the carrier board.



Related Document

Document Type	Title	Available
Application Note	AN4878 - System-On-Module (SOM) Pick and Place Guidelines	www.microchip.com

1. Generic Instructions

1.1 Module Dimensions

The SOMs have total dimensions as described in the table below:

Table 1-1. System-On-Module Dimensions

Module Name	Parameter	Common Dimensions			Unit
		Min	Typ	Max	
SAMA5D27 SOM	Width	39.90	40.00	40.10	mm
	Height	37.90	38.00	38.10	mm
	Total Thickness	–	2.75	2.80	mm
SAMA5D27 WLSOM	Width	40.70	40.80	40.90	mm
	Height	40.70	40.80	40.90	mm
	Total Thickness	–	3.287	3.387	mm
SAM9X60D1G SOM	Width	27.90	28.00	28.10	mm
	Height	27.90	28.00	28.10	mm
	Total Thickness	–	2.40	2.45	mm
SAMA7G54 SOM	Width	37.80	38.00	38.20	mm
	Height	29.80	30.00	30.20	mm
	Total Thickness	–	3.13	3.50	mm
SAM9X75 SOM	Width	34.85	35.00	35.15	mm
	Height	29.85	30.00	30.15	mm
	Total Thickness	–	2.80	2.85	mm
SAMA7D65 SOM	Width	37.80	38.00	38.20	mm
	Height	37.80	38.00	38.20	mm
	Total Thickness	–	2.80	2.96	mm

1.2 Storage Conditions

1.2.1 Moisture Barrier Bag Before Opening

The SOMs are delivered in moisture barrier bags. Before use, these must be stored at a temperature of less than 30°C, with humidity under 85% RH.

The calculated shelf-life for the dry-packed product is 12 months from the date the bag is sealed.

1.2.2 Open Moisture Barrier Bag

The moisture indicator card, present in the component dry pack, shows a color change from blue to pink when moisture levels in the bag rise.

The humidity indicator cards must be blue with an RH < 30%. If the color is different, baking instructions must be respected with extreme caution.

2. Bake Information

Microchip SOMs are rated MSL3; storage and assembly processes must comply with IPC/JEDEC J-STD-033C.

The SOMs have a total thickness comprised between 2.45 and 3.50 mm (PCB and SMD mounted) and are comparable to a die package. Thus, baking instructions must comply with Table 4-1 of J-STD-033C as a package body comprised between 2.0 mm and 4.5 mm. See the summary table below.

Table 2-1. IPC/JEDEC Table Extract

Package Body	MSL Level	Bake @ 125°C		Bake @ 90°C ≤ 5% RH		Bake @ 40°C ≤ 5% RH	
		Exceeding Floor Life by > 72h	Exceeding Floor Life by ≤ 72h	Exceeding Floor Life by > 72h	Exceeding Floor Life by ≤ 72h	Exceeding Floor Life by > 72h	Exceeding Floor Life by ≤ 72h
Thickness > 2.0 mm ≤ 4.5 mm	3	48 hours	48 hours	10 days	8 days	79 days	67 days

Note: It is recommended to bake the carrier board PCB before the assembly process and store it in a dry cabinet to prevent moisture regain and delamination.

3. Carrier Board Stencil Design

It is recommended to use a laser-cut, stainless-steel type with thickness equal or higher than 150 μm , and a ratio of -3% for stencil opening to land pattern dimension.

To improve paste release, a positive taper with a bottom opening 25 μm larger than the top is used. If necessary, the manufacturer may propose other combinations of stencil thickness and aperture size to obtain good results, for example, a multi-level stepped stencil.

4. Carrier Board Solder Paste

Depending on the final application of the customer board and assembly constraints, either a low-temperature soldering or common lead-free soldering process can be used. Two types of solder paste are available, depending on the assembly process and the reflow profile:

- SnBi Eutectic composition for low-temperature lead-free solder reflow applications
- SnAgCu Eutectic composition for most common lead-free solder reflow applications

For each solution, the reflow profile must be adapted according to the solder paste used during the assembly phase. Some examples are given in the next paragraph.

4.1 Low-Temperature Soldering

Low-temperature soldering is a subject of considerable interest for mechanical, financial and environmental aspects compared to more common soldering processes using SAC 305 and its variants.

This approach can be used for the assembly of the SOM on its main board during the first or the second reflow process.

The most technically significant advantage is reduced warping of component and substrates. By using this soldering process, lower-cost plastics can be integrated, component and laminate materials can be used, and energy consumption is reduced with associated financial and environmental benefits.

The SnBi eutectic solder with melting temperature of around 140°C is most commonly used for low-temperature lead-free solder reflow applications.

Some recommended solder pastes are listed below (no clean solder paste):

- Indalloy® 281 from Indium Corp.
- Interflux® DP 5600 from Interflux Electronics
- L20-BLT5-T7F from Senju

4.2 Common Temperature Soldering

The SnAgCu eutectic solder with melting temperature of 217°C is most commonly used for lead-free solder reflow applications.

This alloy is widely accepted in the semiconductor industry due to its low cost, relatively low melting temperature, and good thermal fatigue resistance.

Some recommended solder pastes are listed below (no clean solder paste):

- NC-SMQ® 230 from Indium Corp.
- Indalloy 241 from Indium Corp.
- N705-GRN3360-K2-V Type 3 from Senju
- M705-GRN360-K-V from Senju

5. Reflow Profiles

The SOM is assembled using the IPC/JEDEC J-STD-020E-compliant reflow profile.

In addition to the initial assembly solder, we recommend a maximum of two additional soldering processes:

- Assembly on the main board
- Spare heating pass in case the SOM must be removed from the main board for analysis

The SOM can be soldered to the host PCB by using one of the standard SnAgCu or SnBi solder reflow profile. To avoid any damage to the SOM, follow the JEDEC recommendations as well as those listed below:

- Do not exceed solder paste recommended peak temperature (T_p).
- Refer to the solder paste data sheet for specific reflow profile recommendations.
- Use no-clean flux solder paste.
- Use only one flow. If the PCB requires multiple flows, mount the SOM at the time of the final flow.

Figure 5-1. Reflow Profile Example used for Soldering the System-On-Module on an Application Board

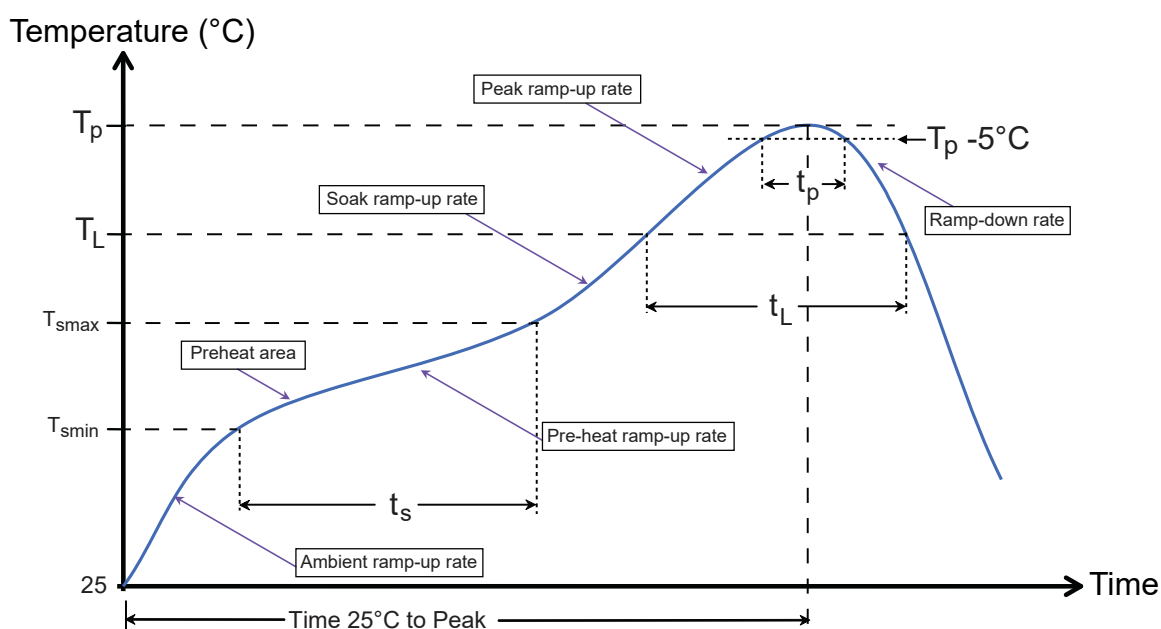


Table 5-1. Reflow Profile Parameters According To Solder Paste Used

Symbol	Profile Feature	Value according to Solder Paste	
		Interflux DP 5600	NC-SMQ 230
T_{smin}	Pre-heat minimum temperature	100°C	150°C
T_{smax}	Pre-heat maximum temperature	120°C	180°C

.....continued

Symbol	Profile Feature	Value according to Solder Paste	
		Interflux DP 5600	NC-SMQ 230
T_L	Liquidus temperature	Refer to solder paste manufacturer's recommendations (e.g. 139°C for Interflux DP 5600)	Refer to solder paste manufacturer's recommendations (e.g. 220°C for NC-SMQ 230)
T_P	Maximum peak temperature	190°C (must be comprised between 160°C and 190°C depending on the solder paste used)	245°C (must be comprised between 230°C and 245°C depending on the solder paste used)
25 to T_{smin}	Ambient ramp-up rate	1 to 3°C/sec. max.	1 to 5°C/sec. max.
t_s (from T_{smin} to T_{smax})	Temperature rise	20 to 90 seconds	30 to 90 seconds
	Pre-heat ramp-up rate	0.2°C to 1°C/sec. max.	0.5°C to 1°C/sec. max.
T_{smax} to T_L	Soak ramp-up rate	1°C to 4°C/sec. max.	1°C to 4°C/sec. max.
T_L to T_P	Peak ramp-up rate	1°C to 4°C/sec. max.	1°C to 3°C/sec. max.
t_L	Liquidus temperature time maintained above T_L	30 to 90 seconds	60 to 150 seconds
t_P	Time (t_P) within 5°C of the peak temperature (T_P)	15 seconds	30 seconds
T_P to T_L	Ramp-down rate	1°C to 4°C/sec. max.	2°C to 6°C/sec. max.
–	Time from 25°C to peak temperature	3 minutes max.	8 minutes max.

6. Land Pattern Definition

The SOM land patterns to apply on the main board PCB designs are provided in the following sections.

6.1 SAMA5D27 SOM Land Pattern (Host Board PCB Footprint)

Figure 6-1. SAMA5D27 SOM Land Pattern Drawing

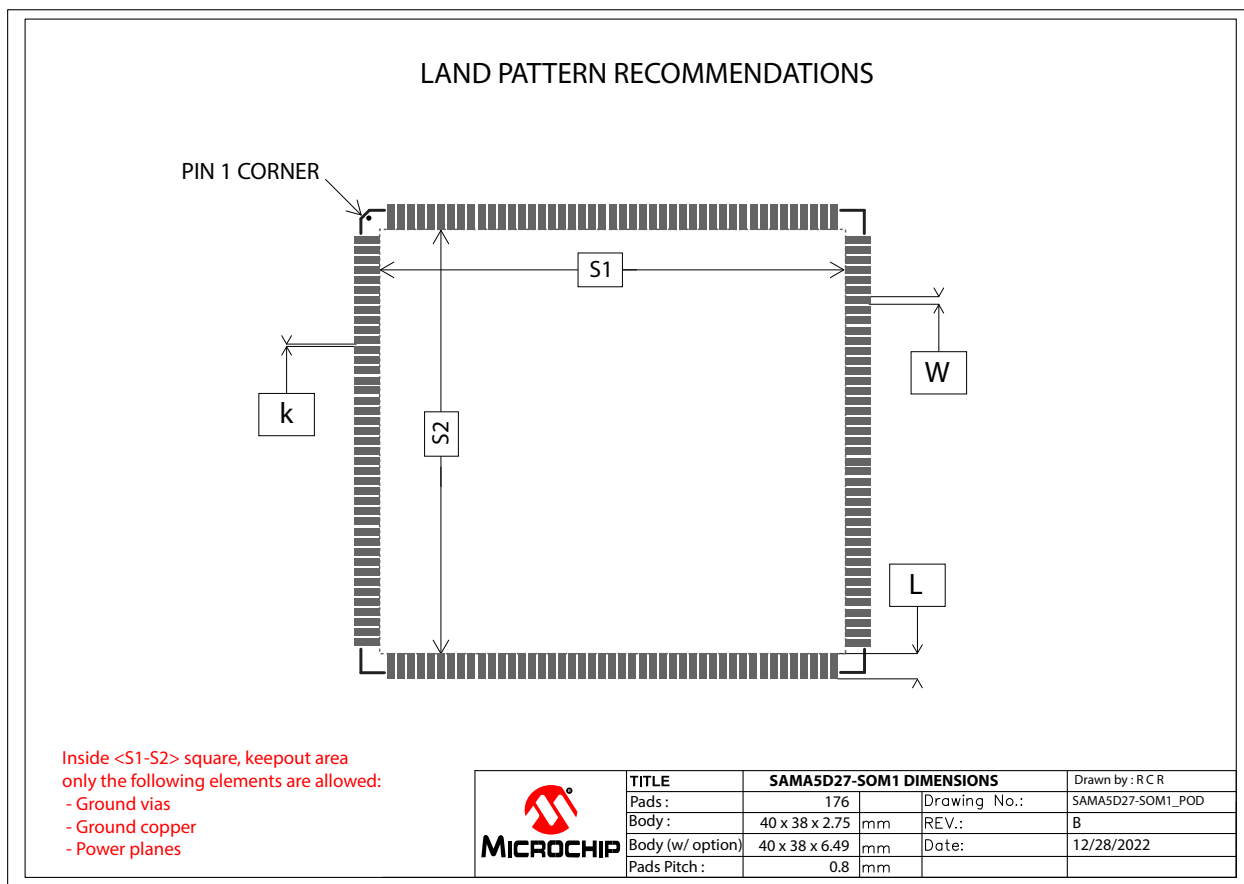


Table 6-1. SAMA5D27 SOM Land Pattern Dimensions (in mm)

Symbol	Parameter	Common Dimensions		
		Min	Typ	Max
W	Land pattern pad width	-	0.600	-
L	Land pattern pad length	-	2.000	-
S1	Land pattern pad X space	-	37.000	-
S2	Land pattern pad Y space	-	35.000	-
k	Land pattern pad gap	-	0.200	-

Note: Under the SOM, GND and Power planes should be placed on the top layer of the carrier board with evenly-distributed vias.

6.2 SAMA5D27 WLSOM Land Pattern (Host Board PCB Footprint)

Figure 6-2. SAMA5D27 WLSOM Land Pattern Drawing

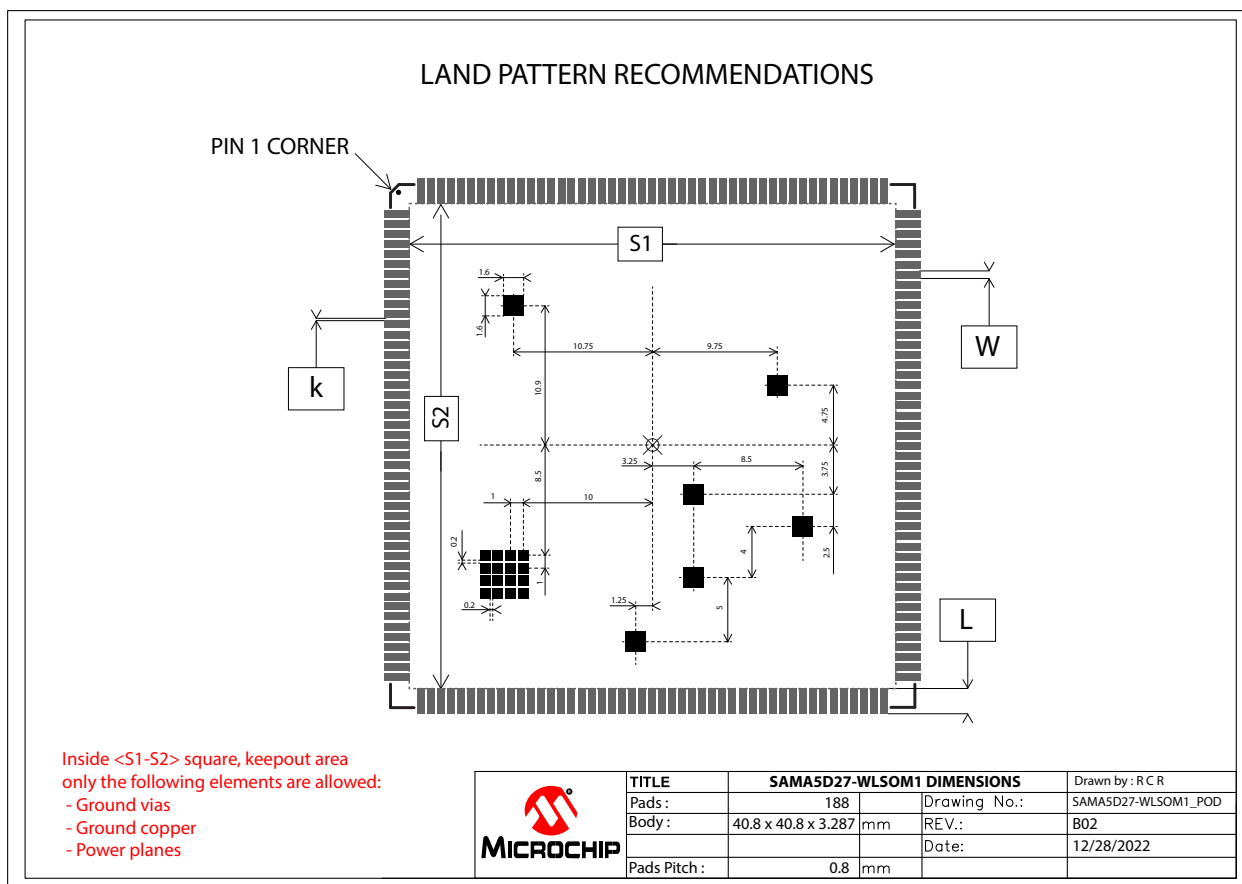


Table 6-2. SAMA5D27 WLSOM Land Pattern Dimensions (in mm)

Symbol	Parameter	Common Dimensions		
		Min	Typ	Max
W	Land pattern pad width	-	0.600	-
L	Land pattern pad length	-	2.000	-
S1	Land pattern pad X space	-	37.800	-
S2	Land pattern pad Y space	-	37.800	-
k	Land pattern pad gap	-	0.200	-

Note: Under the SOM, GND and Power planes should be placed on the top layer of the carrier board with evenly-distributed vias.

6.3 SAM9X60D1G SOM Land Pattern (Host Board PCB Footprint)

Figure 6-3. SAM9X60D1G SOM Land Pattern Drawing

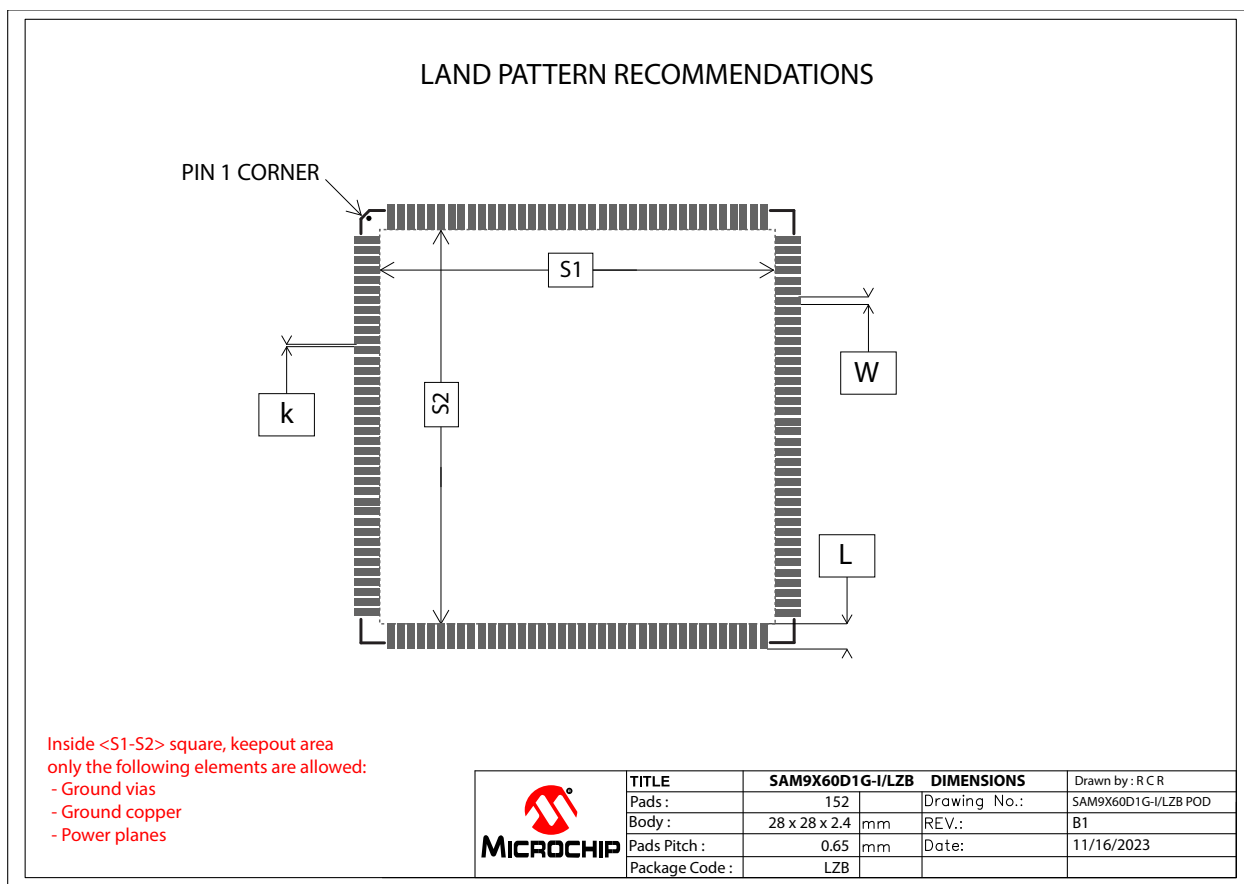


Table 6-3. SAM9X60D1G SOM Land Pattern Dimensions (in mm)

Symbol	Parameter	Common Dimensions		
		Min	Typ	Max
W	Land pattern pad width	-	0.450	-
L	Land pattern pad length	-	1.200	-
S1	Land pattern pad X space	-	26.400	-
S2	Land pattern pad Y space	-	26.400	-
k	Land pattern pad gap	-	0.200	-

Note: Under the SOM, GND and Power planes should be placed on the top layer of the carrier board with evenly-distributed vias.

6.4 SAMA7G54 SOM Land Pattern (Host Board PCB Footprint)

Figure 6-4. SAMA7G54 SOM Land Pattern Drawing

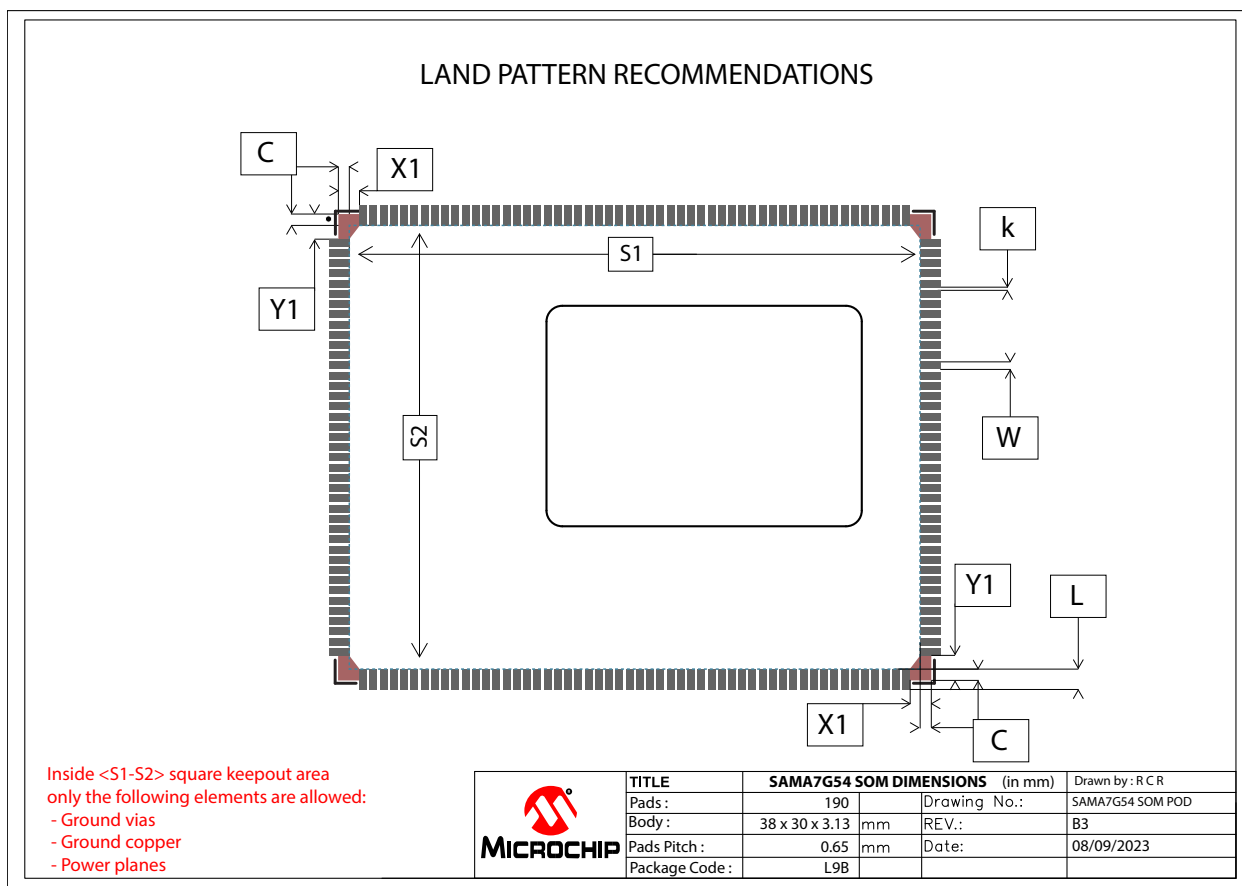


Table 6-4. SAMA7G54 SOM Land Pattern Dimensions (in mm)

Symbol	Parameter	Common Dimensions		
		Min	Typ	Max
W	Land pattern pad width	-	0.450	-
L	Land pattern pad length	-	1.200	-
S1	Land pattern pad X space	-	36.200	-
S2	Land pattern pad Y space	-	28.200	-
k	Land pattern pad gap	-	0.200	-
C	Corner Pads Position	--	0.700	--
X1		--	1.350	1.400
Y1		--	1.575	1.625

Note: Under the SOM, GND and Power planes should be placed on the top layer of the carrier board with evenly-distributed vias.

6.5 SAM9X75 SOM Land Pattern (Host Board PCB Footprint)

Figure 6-5. SAM9X75 SOM Land Pattern Drawing

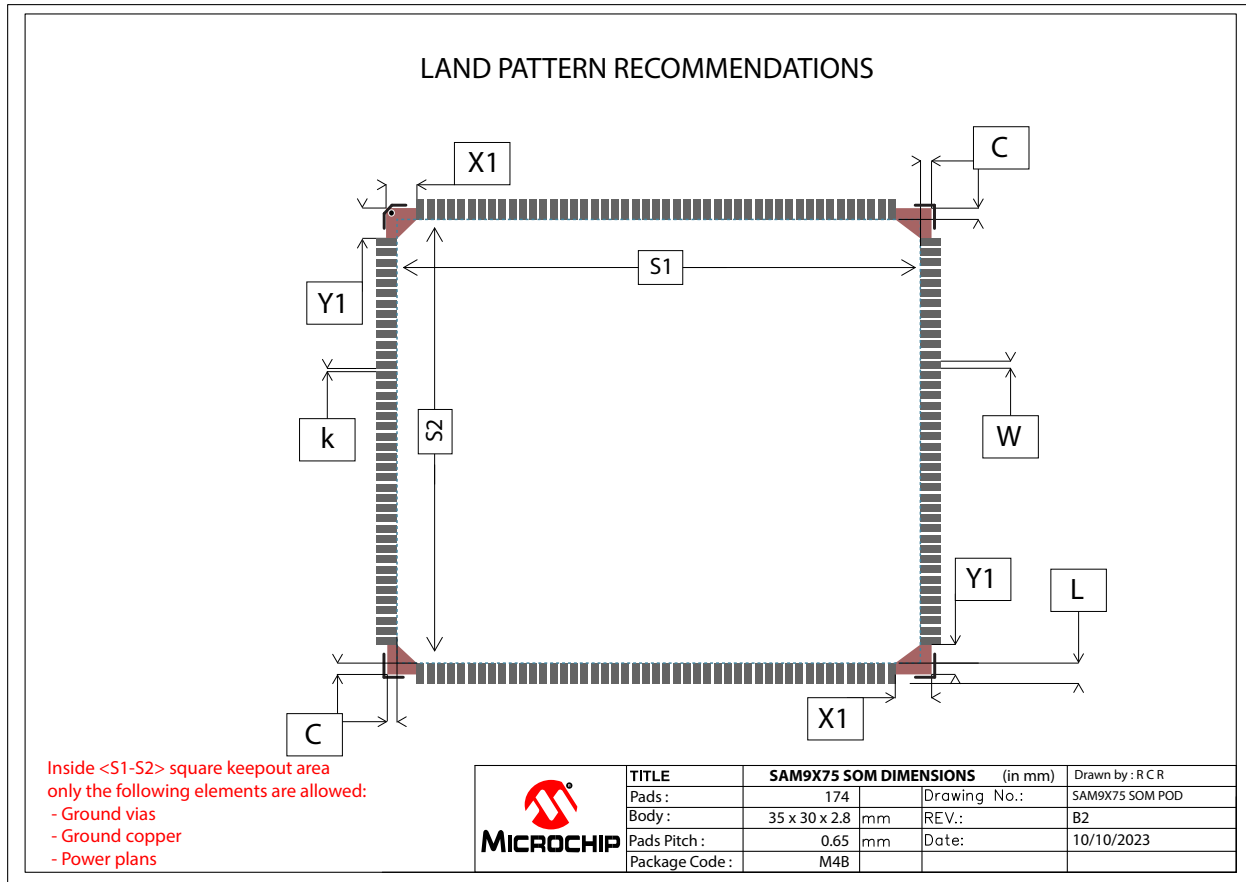


Table 6-5. SAM9X75 SOM Land Pattern Dimensions (in mm)

Symbol	Parameter	Common Dimensions		
		Min	Typ	Max
W	Land pattern pad width	-	0.450	-
L	Land pattern pad length	-	1.200	-
S1	Land pattern pad X space	-	33.200	-
S2	Land pattern pad Y space	-	28.200	-
k	Land pattern pad gap	-	0.200	-
C	Corner Pads Position	--	0.550	--
X1		--	2.325	2.375
Y1		--	2.100	2.150

Note: Under the SOM, GND and Power planes should be placed on the top layer of the carrier board with evenly-distributed vias.

6.6 SAMA7D65 SOM Land Pattern (Host Board PCB Footprint)

Figure 6-6. SAMA7D65 SOM Land Pattern Drawing

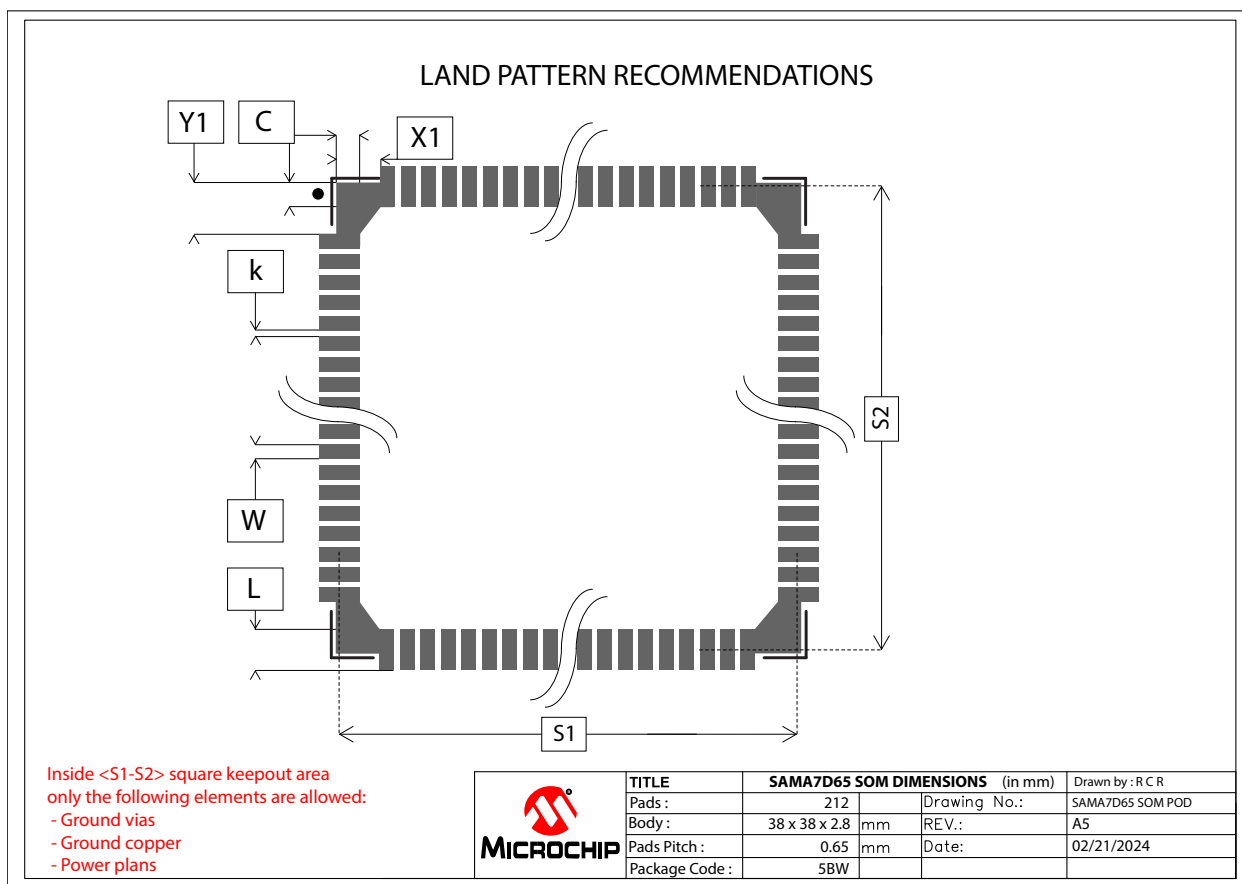


Table 6-6. SAMA7D65 SOM Land Pattern Dimensions (in mm)

Symbol	Parameter	Common Dimensions		
		Min	Typ	Max
W	Land pattern pad width	-	0.450	-
L	Land pattern pad length	-	1.200	-
S1	Land pattern pad X space	-	37.400	-
S2	Land pattern pad Y space	-	37.400	-
k	Land pattern pad gap	-	0.200	-
C	Corner Pads Position	--	0.700	--
X1		--	1.675	--
Y1		--	1.675	--

Note: Under the SOM, GND and Power planes should be placed on the top layer of the carrier board with evenly-distributed vias.

7. Board Opening Definition

Some Microchip SOMs are equipped with components on both sides. For correct mounting of these SOMs, an opening must be made in the carrier board. This section provides the recommended dimensions of the opening.

7.1 SAMA7G54 SOM Board Opening

Figure 7-1. SAMA7G54 SOM Board Opening

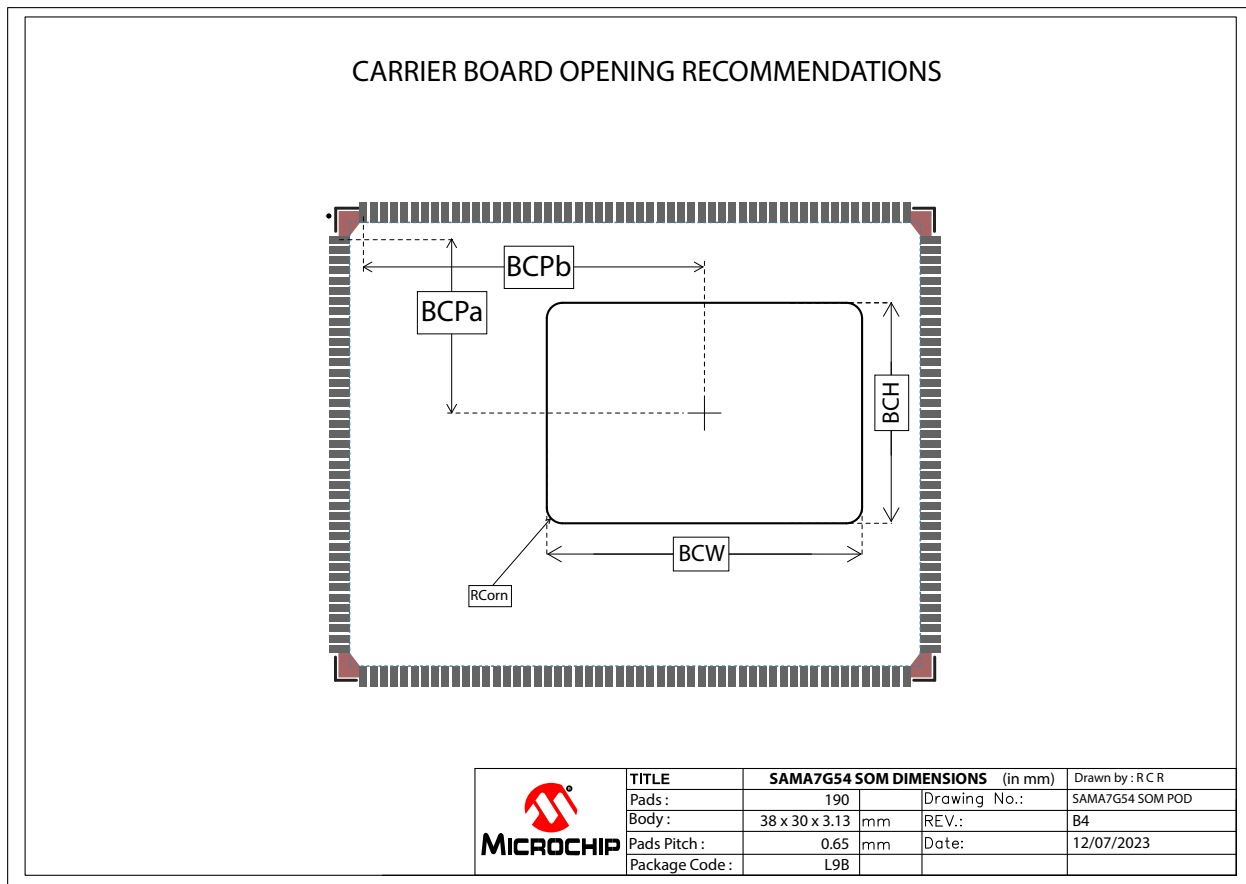


Table 7-1. SAMA7G54 SOM Board Opening Dimensions (in mm)

Symbol	Parameter	Common Dimensions		
		Min	Typ	Max
BCPa	Board cutout X position	-	11.025	-
BCPb	Board cutout Y position	-	21.725	-
BCW	Board cutout width	19.525	-	24.925
BCH	Board cutout height	13.325	-	19.000
RCor	Board cutout corner radius	-	1.000	-

Note: RCor diameter dimensions can be modified according to the PCB tooling specification.

8. Revision History

8.1 Rev. C - 11/24

Updated [Land Pattern Definition](#) and [Module Dimensions](#) with SAMA7D65 SOM information

8.2 Rev. B - 07/24

Added:

- [Related Document](#)
- [SAMA7G54 Land Pattern](#)
- [SAM9X75 SOM Land Pattern](#)
- [Board Opening Definition](#)

Updated:

- [Module Dimensions](#)
- [Bake Information](#)
- [Carrier Board Solder Paste](#)

8.3 Rev. A - 01/24

First issue.

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[ATSAMA5D27-SOM1](#), [ATSAMA5D27-WLSOM1](#), [SAM9X60D1G](#), [SAM9X75D1G](#), [SAM9X75D2G](#),
[SAMA7D65D1G](#), [SAMA7D65D2G](#), [SAMA7G54D1G](#), [SAMA7G54D2G](#)