Customer Process Guidelines

AirPrime WS6318

SIERRA WIRELESS®

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4.0
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Consult our website for up-to-date product descriptions, documentation, application notes, firmware upgrades, troubleshooting tips, and press releases: www.sierrawireless.com

Document History

Version	Date	Updates
1.0	January 30, 2012	Creation
1.1	March 26, 2012	Updated the document template and legal boilerplates
2.0	June 4, 2012	Update of reflow profile (4.2)
2.1	June 20, 2012	Updated legal boilerplate
3.0	February 27, 2013	Update of reflow profile recommendations (4.2)
4.0	May 14, 2014	Update of customer baking recommendations (sections 2.1.3 and 5), and addition of 2 paragraphs in chapters 3.2.2 and 4.1)

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1. Introduction

1.1. Overview

This document presents guidelines for the industrial assembly of an AirPrime WS6318 Intelligent Embedded Module on an application.

1.2. Reference Documents

[1] Product Technical Specification & Customer Design Guidelines for AirPrime WS6318

Reference number: 4110999

[2] JEDEC standard JESD625-A, Requirements for Handling Electrostatic Discharge-Sensitive (ESDS) Devices

[3] IPC/JEDEC J-STD-033A - Handling, Packing, Shipping and Use of Moisture / Reflow Sensitive Surface Mount Devices

2. Handling

2.1. Storage and Handling of the WS6318 Module

2.1.1. Storage Condition

AirPrime WS6318 units can be stored in their sealed, original packages, over the course of up to 1 year.

They can withstand a storage temperature range comprised between -40°C to +85°C, nevertheless when packed into T&R, the upper storage temperature is decreased to +40°C due to T&R packaging material.

Tip: *For optimal results, the recommended storage temperature is +20°C +/- 10 degrees.*

2.1.2. ESD

The AirPrime WS6318 unit is ESD sensitive, specifically as follows:

- Level class 2 for HBM (2KV)
- Level class B for MM (200V)
- Level class III for CDM (500V)

It is recommended to use standard ESD precautions, as described in the following norm:

- JEDEC standard JESD625-A, Requirements for Handling Electrostatic Discharge-Sensitive (ESDS) Devices.

2.1.3. Moisture Sensitivity

The AirPrime WS6318 product is sensitive to moisture absorption:

- MSL 3, 245 °C, 2 reflows allowed on customer PCB including one for rework of the component.

Caution: *If the vacuum bag is open for more than 168h, material should be baked for 48 hours at 125°C in tray. Nevertheless, due to the long baking time, it is recommended to store the modules in dry cabinet once the vacuum bag is opened.*

It is recommended to follow the standard MSL procedure, as described in the following norm:

- IPC/JEDEC J-STD-033A - Handling, Packing, Shipping and Use of Moisture / Reflow Sensitive Surface Mount Devices.

2.2. Component Package

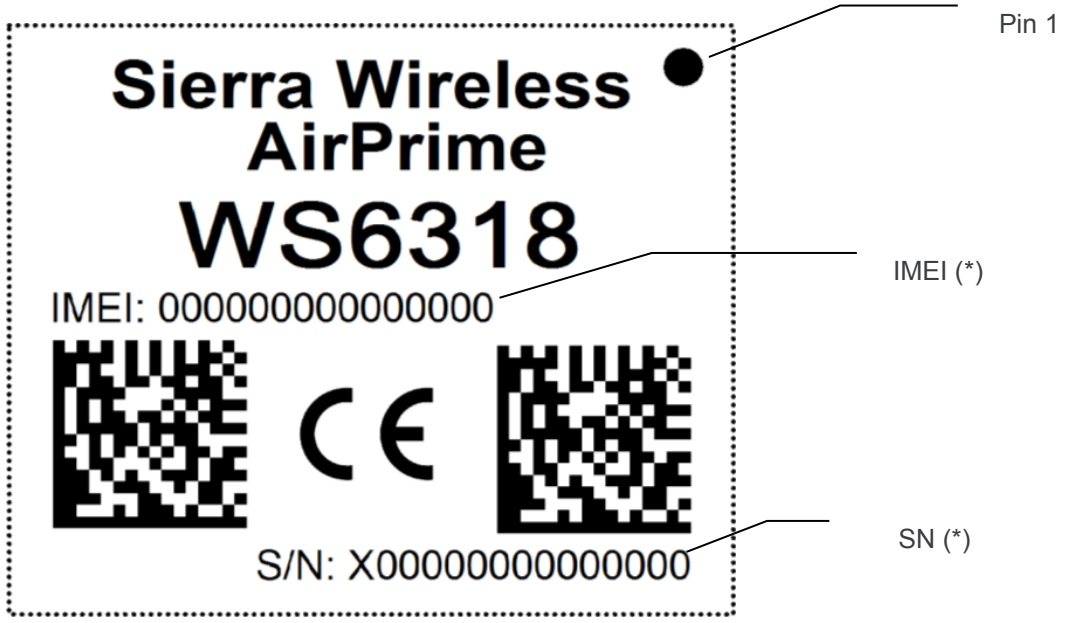
2.2.1. Package Description

The WS6318 module is a scalable QFN 70 terminals, 17.85x15.05x2.5 mm, pitch 0.8 mm.

QFN package is a quad flat no lead package.

For additional information, refer to document [1] Product Technical Specification & Customer Design Guidelines for AirPrime WS6318.

2.2.2. Marking Description



(*): data matrix bar code

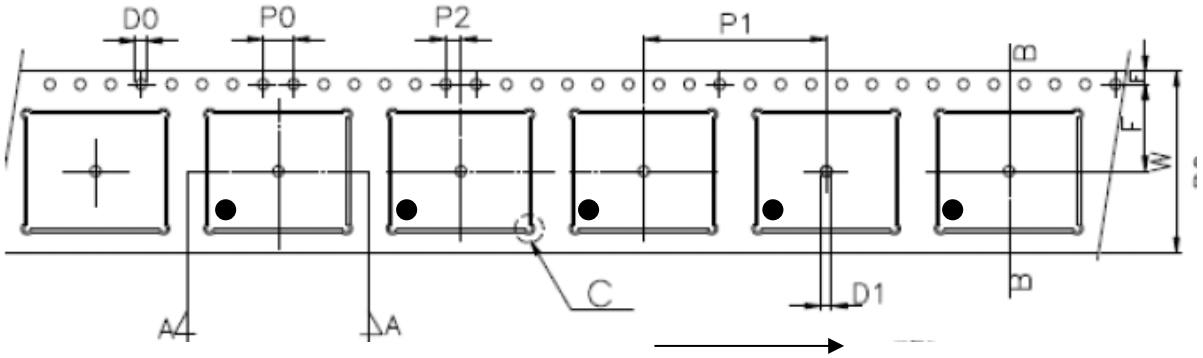
Figure 1. AirPrime WS6318 Product Label

2.3. Component Packing

2.3.1. Packing Description

The AirPrime WS6318 product is delivered in tape and reel.

Quantity per tape & reel is 750.



P1	P0	W
24.0 mm	4.0 mm	24.0 mm

Figure 2. Packing Description

2.3.2. Packing Label

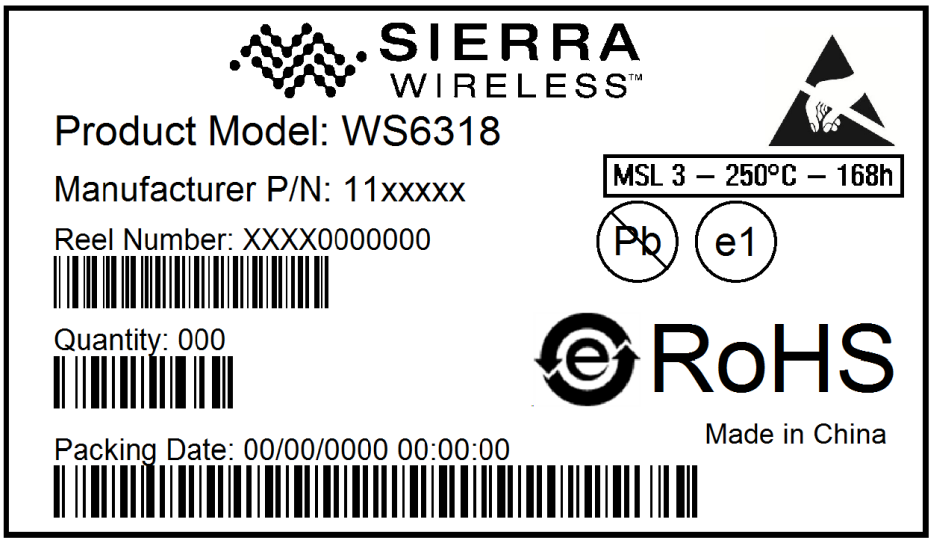


Figure 3. Packing Label

3. SMT Assembly Process

This section presents information and recommendations for the industrial assembly of the AirPrime WS6318 products on the application.

Note: The WS products should be assembled by reflow process.

3.1. Lead-Free Process

In compliance with directive 2002/95/CE, Sierra Wireless products do not contain the following hazardous substances:

- mercury (Hg),
- lead (Pb),
- cadmium (Cd),
- hexavalent chromium (Cr+6),
- polybrominated diphenyl ether (PBDE),
- polybrominated biphenyl (PBB).

The AirPrime WS6318 modules are manufactured with RoHS compliant components and processes.

3.2. PCB Design Requirements

3.2.1. PCB Surface Finish

The PCB surface finish recommended is Electroless Nickel, immersion Gold. Organic Solderability Preservative (OSP) may also be used.

Caution: *Hot Air Solder Leveled finish (HASL) is not recommended because the process does not give consistent solder volumes on each pad because of poor pad flatness.*

3.2.2. Land Pad

In order to produce high assembly yields and a reliable solder joint, the land pad design should match the figure presented below.

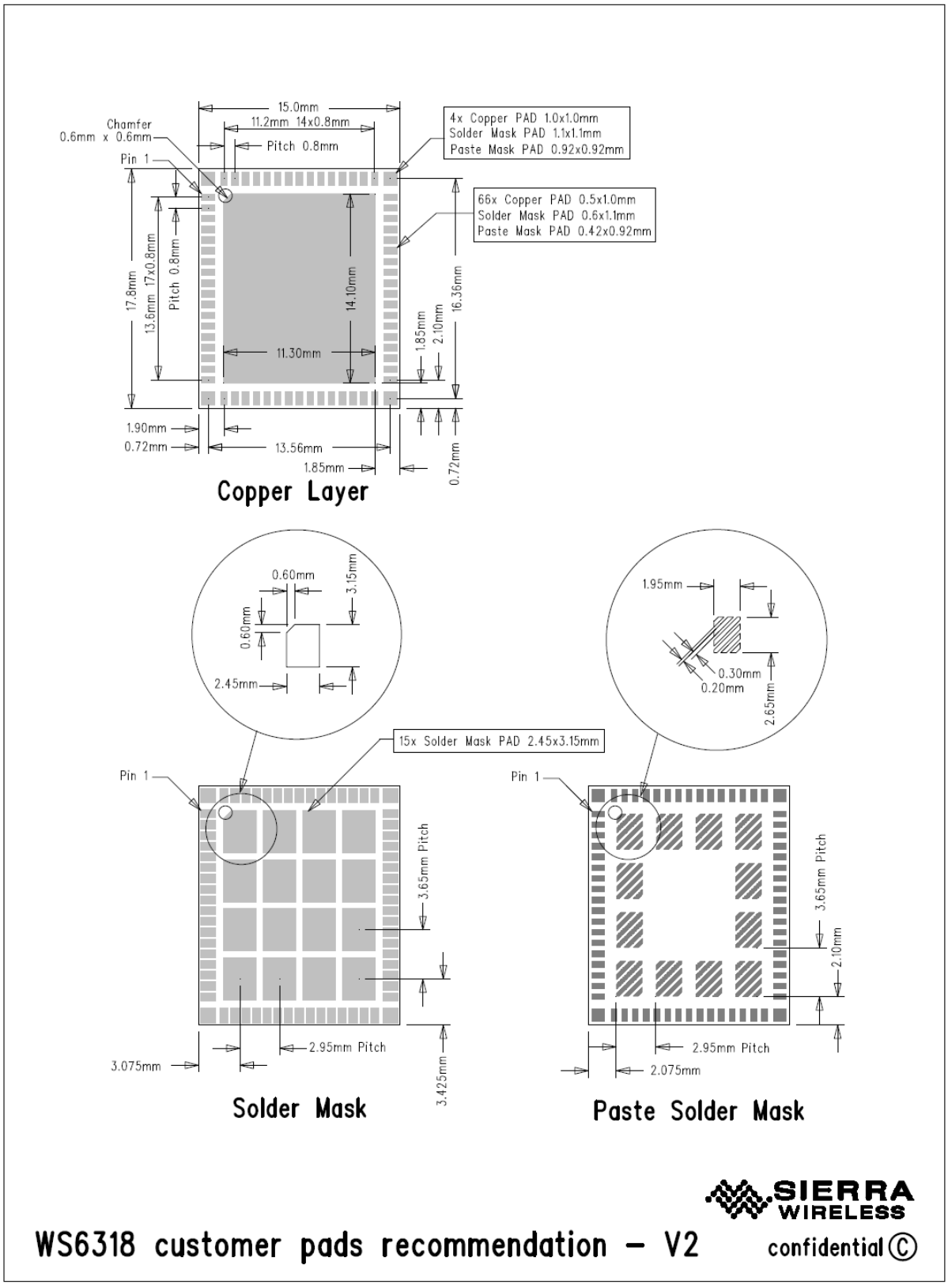


Figure 4. Pad Layout for AirPrime WS6318

Note: *The 16 inner pads and the 4 corner pads are ground pads.*

For the central ground pads, it is recommended to only solder the 12 external pads (as indicated on the solder paste mask), as it decreases void occurrence.

Warning: *It is recommended to have a GROUND area under the WS6318 module. This ground area should be a whole area of copper with proper ground vias to provide a good grounding system between the application and the embedded module and improved thermal dissipation.*

The ground vias may be micro-vias, filled or unfilled.

In any case, there shall not be any SIGNAL trace or hole / micro-via under the AirPrime WS6318 product.

The solder pad should not extend out of the module as the PCA edge is conductive.

It is recommended to leave a component-free area of 2 mm around the WS6318 unit.

The recommended manufacturing tolerance for copper pad is ± 30 µm.

3.3. Solder Mask

The pads on the printed circuit board are either Solder Mask Defined (SMD) or Non Solder Mask Defined (NSMD).

Since the copper etching process has tighter control than solder masking process, NSMD pads are preferred over SMD pads.

Moreover, NSMD pads with solder mask opening larger than the metal pad size also improve the reliability of solder joints, as this limits the stress concentration at the solder-to mask corner interface.

For the external pads, the solder mask opening should be 100 µm to 150 µm larger than the pad, resulting in 50 µm to 75 µm clearance between the copper pad and solder mask. This allows for solder mask registration tolerances, depending upon the PCB fabricator's capabilities.

For the ground pads, SMD should be used as a ground area is recommended under the WS6318 module.

Recommended solder mask thickness on top copper is 10 to 30 µm.

4. Board Mounting Guidelines

4.1. Stencil Design

The recommended stencil thickness is 125 µm.

The proposed stencil design is presented in Figure 4 above. This proposal targets to reduce voids occurrence. Usage of strip lines for ground pads apertures and soldering only 12 ground pads (on 16) has reduced the solder voids occurrence.

It is highly recommended to monitor the solder paste height, registration and proper placement during the squeegee printing.

4.2. Solder Reflow Profile

Lead-free SMT reflow profiles should be used to surface mount the AirPrime WS6318 product.

The reflow profile depends on PCB density and type of solder paste being used. The paste manufacturer's recommendation should also be considered to determine the proper reflow profile.

Important: *To preserve module integrity, assembly profile must fulfill the requirements below.*

Peak Temperature	245°C max
Reflow time (over 220°C)	60 sec max

2 reflows are allowed on the customer PCB including one for rework of the component if necessary.

The figure below is an example of reflow profile.

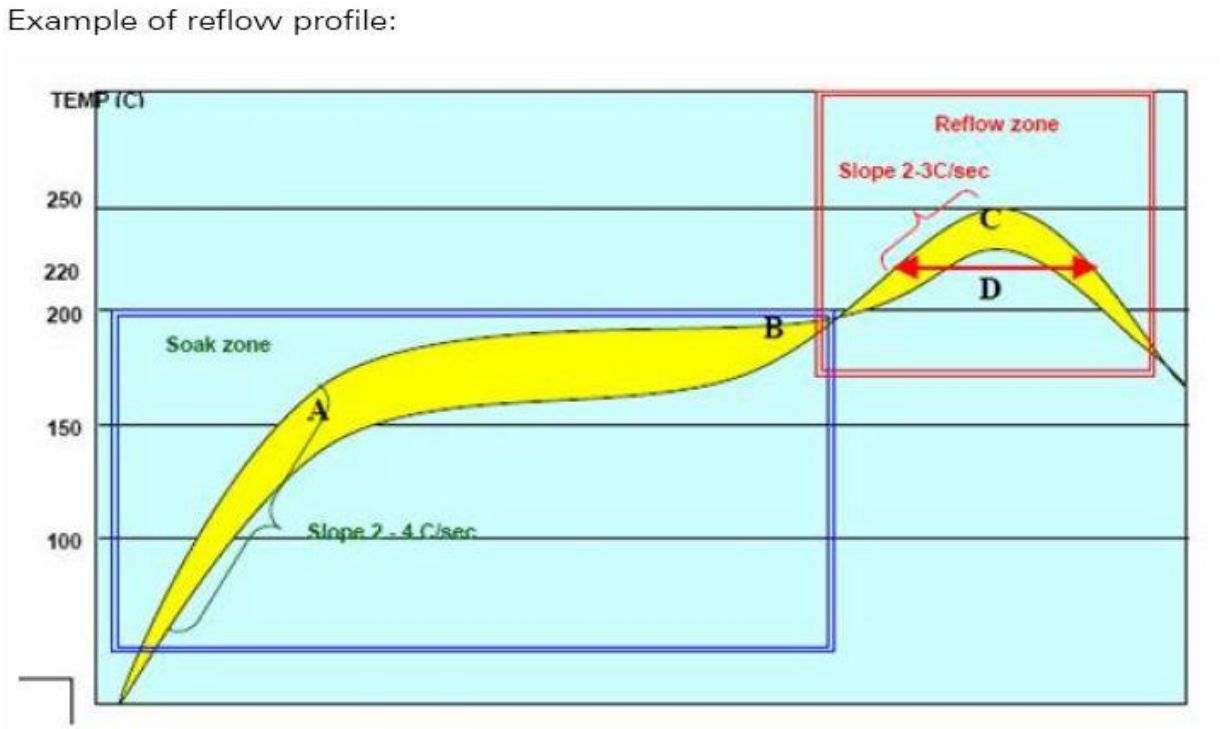


Figure 5. Recommended Reflow Profile

Additional recommendations are presented in the table below for consideration.

Factor	Recommendation
Max slope	2 to 4 °C / sec
Soak time (between A and B: 150 and 190 °C)	60 to 120 sec
Reflow time (D: over 220°C)	40 to 60 sec
Max temperature (C)	235 – 245 °C
Cooling down slope	1 to 3 °C / sec

5. Rework Guidelines

Rework tools and operating parameters are customer/application specific. Rework tools, heating profiles and the rework process should be tailored to these specific needs for optimum results.

Prior to any rework, if the component floor life has been exceeded, it is highly recommended to bake the PCB in order to remove moisture from the assembly. (See paragraph 6 - Board rework of the document IPC / JEDEC J-STD-033A. If possible for the PCB and the other components of the board, apply 125°C for 48 hours.) The pre-baking process will prevent damage to any component due to moisture vapor pressures caused during reflow.

5.1. Component Removal

The step consists of reflowing the solder joints attaching components to the PCB. Ideally, the reflow profile for part removal should be the same as the one used for part attachment. However, the time above liquidus can be reduced as long as the reflow is complete.

In the removal process, it is recommended that the board should be heated from the bottom side using convective heaters and hot gas, or hot air or IR should be used on the top side of the component. Special nozzles or IR lens should be used to direct the heating in the component area and heating of adjacent components should be minimized.

Excessive airflow should also be avoided, as this causes the component to overheat.

Once the joints have reflowed, the vacuum lift-off should be automatically engaged for pick-up during the transition from reflow to cool down.

Warning: *If heating conditions are not properly controlled during manual hot removal from PCB assembly, package integrity can be damaged from overheating.*

5.2. Pad Redress

Once the component has been removed, the site and pads need to be cleaned properly. It is better to use the combination of a blade style conductive tool and a fluxed desoldering braid.

Once the residual solder has been removed, the land pads should be cleaned with a solvent. The solvent is usually specific to the type of solder paste used in the original assembly and the paste manufacturer’s recommendations should be followed.

5.3. Solder Paste Deposit

Once the PCB is properly cleaned and inspected, solder paste should be applied on the solder land (on the component itself or on the customer PCB) with a mini-stencil which has same thickness and apertures as the stencil used for original attachment.

5.4. New Component Placement

A slip-beam optical system should be used to align the component to the PCB. This method will display an image of the land pad overlaid on the mating footprint and aid in proper alignment. Similar to paste printing, the alignment should be done under magnification of 50x to 100x.

5.5. New Component Soldering

The reflow profile developed during original attachment or removal should be used to attach the new component.

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