Moisture Sensitivity Level 3 (MSL 3)
Handling Guidelines

The detrimental effects of absorbed moisture in semiconductor packages during SMT assembly have been well documented in technical publications, manufacturers' literature and various industry standards. The purpose of this document is to identify areas of potential concern for end users and steps they should take to preclude problems.

1. Affected Packages and Devices

SkyTraq follows JEDEC standards for moisture classifications. The following SkyTraq packages are classified as MSL 3:

• LGA-44 (i.e., Venus634LPx, Venus634FLPx, Venus634LP-I, Venus634LP-C)

2. MSL 3 Handling at PCB Assembly

SkyTraq's packages listed above are moisture sensitive and need to be handled within proper MSL 3 guidelines to avoid damage from moisture absorption and exposure to solder reflow temperatures that can result in yield and reliability degradation.

A) During PCB Assembly

1. Devices are baked and dry-packed before shipment from SkyTraq's factory. The packing uses a Moisture Barrier Bag (MBB). A Humidity Indicator Card (HIC) and drying desiccant are included inside the MBB. A MSL 3 label is attached to caution that the bag contains moisture sensitive devices.
2. Shelf life of devices in a sealed bag is 12 months at <40ºC and <90% room humidity (RH).
3. Upon opening of MBB, the HIC should be checked immediately; devices require baking before board mounting if the HIC is >10% when read at 23ºC ±5ºC.
4. After MBB is opened, devices should go through reflow for board assembly within 48 hours at factory conditions of <30ºC/60% RH, or stored at <10% RH. If both of these conditions are not met, baking is required before board mounting.
5. If baking is required, devices should be baked for a minimum of 8 hours at 125ºC.

B) Handling Unused Devices

1. Any unused devices after the MBB has been opened for more than 48 hours or not stored at <10% RH should be baked before any subsequent reflow and board assembly.
2. Re-baking should be done for a minimum of 8 hours at 125ºC.
3. Unused devices can either be baked and dry-packed first before storage, or they can be baked just before the next board assembly. It is recommended that the former be practiced as it helps to prevent operator error from re-using devices without baking. In both cases, the re-packed materials should follow the guidelines in section 2A.

C) Reworking a Device on a PCB

1. Before a device is removed from the module, the module **must** first be baked.
2. Baking should be done for a minimum of 8 hours at 125ºC.
3. It is recommended that during removal, localized heating be used, and the maximum body temperature of device should not exceed 200ºC.

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4. The replacement device should not exceed the specified floor life of 48 hours.

3. MSL 3 Handling at the End Customer Using SMT Modules

SMT modules using SkyTraq's devices listed in section 1 are moisture sensitive and should be handled within proper MSL 3 guidelines to avoid damage from moisture absorption and exposure to solder reflow temperatures that can result in yield and reliability degradation.

A) Handling SMT Modules with MSL 3 Devices During Main Board Assembly

1. Module manufacturers should bake and dry-pack all modules before shipment. The packing should include:

   a. A suitable MBB that restricts vapor transmission.

   b. Drying desiccant and HIC should be included in the bag.

   c. A MSL 3 label should be displayed prominently to caution that the bag contains moisture sensitive modules.

   It is also recommended that module manufacturers highlight in their datasheet that the SMT modules are rated MSL 3.

2. The end customer should be advised of the shelf life of modules in a sealed bag. It is recommended that shelf life should not exceed 12 months at <40ºC and <90% RH.

3. Upon opening of MBB, the end customer should check the HIC immediately; modules require baking before main board mounting if the HIC is >10% when read at 23ºC ±5ºC

4. After MBB is opened, modules must go through reflow for main board assembly within 48 hours at factory conditions of <30ºC/60% RH, or stored at <10% RH. If both of these conditions are not met, baking is required before main board mounting.

5. If baking is required, modules should be baked for a minimum of 8 hours at 125ºC.

B) Handling Unused Modules

1. Any unused modules after the MBB has been open for more than 168 hours or not stored at <10% RH should be baked before any subsequent reflow and board assembly.

2. Re-baking should be done for a minimum of 8 hours at 125ºC.

3. Unused modules can either be baked and dry-packed first before storage, or they can be baked just before the next assembly onto main board. It is recommended that the former be practiced as it helps to prevent operator error from re-using modules without first baking. In both cases, the repacked modules should follow the guidelines in section 3A.

C) Reworking Modules on Main Board

1. Before a module is removed from the main board, the main board should first be baked.

2. Baking should be done for a minimum of 8 hours at 125ºC.

3. It is recommended that during removal, localized heating be used, and the maximum body temperature of device should not exceed 200ºC.

4. The replacement module should not have exceeded the specified floor life of 168 hours.

4. Reference

Customers may refer to following IPC/JEDEC standards for more details:

- J-STD-033 Standard for Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices
- J-STD-020A Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices