Melexis
Microelectronic Integrated Systems

# Soldering Recommendations for Melexis Products

## Scope

The soldering process stays a potential stress for the semiconductor device and might induce latent reliability issue. This has been reconfirmed with latest technological and environmental developments.
Those challenges, taken into account during Melexis' package qualification, require utmost care and attention during soldering process.
This document describes soldering recommendations applicable to Melexis products.

For any soldering techniques deviating from the ones described below, please contact Melexis to verify compatibility between our products and intended soldering method.

## Moisture sensitivity and Peak Temperature

For components soldered using Surface Mounted Device techniques (eg: reflow process), a significant concern is related to the moisture absorption by package body; which due to increased water vapor pressure when exposed to soldering temperatures, could lead to reliability issues (delamination, package crack, bond fractures…).

For that purpose, moisture sensitivity levels are determined for relevant Melexis components, using the Jedec-020 standard.
Qualified moisture sensitivity level and peak temperature are indicated on product labels, whenever applicable.

Such components should be handled in accordance with Jedec-020 and Jedec-033 at customer site.

## Leadfinish

This plating allows a 100% backwards compatibility with standard SnPb based solders.

Prior to using a Pb free process, please make sure that intended components have suitable plating.

Melexis Pb free devices are processed using state-of-the-art international recommendations to minimize "tin whisker" growth. This includes minimum plating thickness (prior to trim and form) and post plating bake step.
Whisker growth is validated using Jedec-201 standard on a package family basis.

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## Solderability

Plating solderability of Melexis devices is verified during package qualification through application of Jedec-022-B102.
Wetting and De-Wetting evaluations are conducted on specific request.

As a general recommendation, customer should prevent any mechanical stress on device's leads; this is particularly true during soldering process.

## Manual Iron Soldering and Automatic Point-to-Point Iron Soldering

Manual Iron Soldering and Automatic Point-to-Point Iron Soldering methods are allowed for Through Hole applications (Package body needs to be shield from soldering heat by the PCB).
For products in Single In-Line package, customer needs to guarantee and control, through suitable methods, that temperature of the plastic body does not exceed 170C. If body holder of any type is used to keep plastic body in position, not more than 3N/sq.mm pressure shall be used for this purpose.
The soldering iron temperature should be set as low as possible (maximum 350C) and should not exceed recommended soldering time (maximum 5 seconds).

## Reflow

Reflow techniques can be used to solder Melexis SnPb and Pb free devices.
Temperature profile should conform to those described in Jedec-020 standard.

Reflow soldering of through-hole parts, especially in SIP packages, creates a risk for exposing the plastic body to excessive temperatures around and above the $T_G$ of the epoxy mold compound (appr. 170C). To avoid this, a protective tool (shield) has to be used. For any particular case, the actual temperature of the package body throughout the process shall be verified to meet above restriction prior to starting production.
If body holder of any type is used to keep package body in position, not more than 3N/sq.mm pressure shall be used for this purpose.

Please contact Melexis in case you intend to use a reflow soldering process for through hole devices (Single In-line Packages) to verify your soldering process design.

## Wave Soldering

Wave soldering is not recommended for Surface Mounted Device packages.
Please contact Melexis in such case to verify soldering process.

Wave soldering is allowed for through hole application. A pre-heating step is required and should be performed in accordance with international standard recommendations (eg: EN60068-2-20).
For Single In-Line Package products, during the pre-heat and soldering phase, the temperature of the plastic body shall not exceed 170C. If body holder of any type is used to keep package body in position, not more than 3N/sq.mm pressure shall be used for this purpose.

## Welding

An alternative method to connect Melexis sensor's leads to an external leadframe or a wire is welding. As core material of leads is copper, it can be successfully welded to another copper terminal.

Welding methods applied to Melexis Hall sensors in SIP packages shall be focused on having minimum power dissipation into the copper leadframe of the Hall sensors. A good solder joint has to be achieved with a proper power settings and timing of the welding apparatus. Optimal settings shall be defined experimentally, by parameter variation to meet following criteria:

- Temperature of the plastic body of hall sensor shall not exceed 140C during the process. Measurement to be taken with a thermal probe attached to the body center.
- Lead plating material shall be molten only in the spot of welding. No boiling and spattering of the lead plating material shall occur. It may results in solder balls spreading in the neighboring area, solder bridging of terminals or other parts of the external leadframe.
- No deformation of Hall sensor lead core material shall be observed at the point of welding.
- No "spring load" shall remain after welding in the Hall sensor leads toward the sensor body. So Hall sensor terminals shall be planar and in a direct contact to the external leadframe or wires
- Fixing the Hall sensor in position for welding shall be done at the leads close to the body. This gives a sufficient lead length and space for welding and eliminates stress from the fixture applied directly to the plastic body. Such fixture may also act as a heatsink and reduce the heat transferred to the plastic body.

Melexis recommends a laser spot welding as best method to provide a reliable connection of Hall sensor leads to external leadframe. Laser spot welding is focusing the energy in a small spot 0,4 to 0,8 mm diameter for 10-100 msec. With proper power setting a good quality solder joint can be obtained without excessive heat transfer away from the solder spot. Care has to be taken that the two materials are in a direct contact as no additional material is included in the process and even small gap between the lead and external leadframe may create a risk for poor joint or degradation.

Resistance welding is not a recommended method by Melexis. It requires heating of terminals until the core copper material becomes in a plastic state so that the parts can be forged together. It often results

in molten lead plating in a larger area even outside of the welded spot, deformation of leads and higher temperature transferred to the body.
Mechanical pressure applied between the terminals to weld while in the same time body or far end of leads hold by a fixture also may result in a "spring loaded" assembly after welding, what creates a risk for bond wire versus package stress at high temperature applications.

## Melexis Contact

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*Since scientific developments occur daily, these Recommendations may contain outdated material.*

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