Application Note

Solder techniques for TO39 IR sensor product

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Contents

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1. Scope

The purpose of this document is to document an adequate soldering solution for the TO39 IR sensor products. The Melexis IR sensor-MLX90614 is a Through Hole Device (THD). See Fig.1

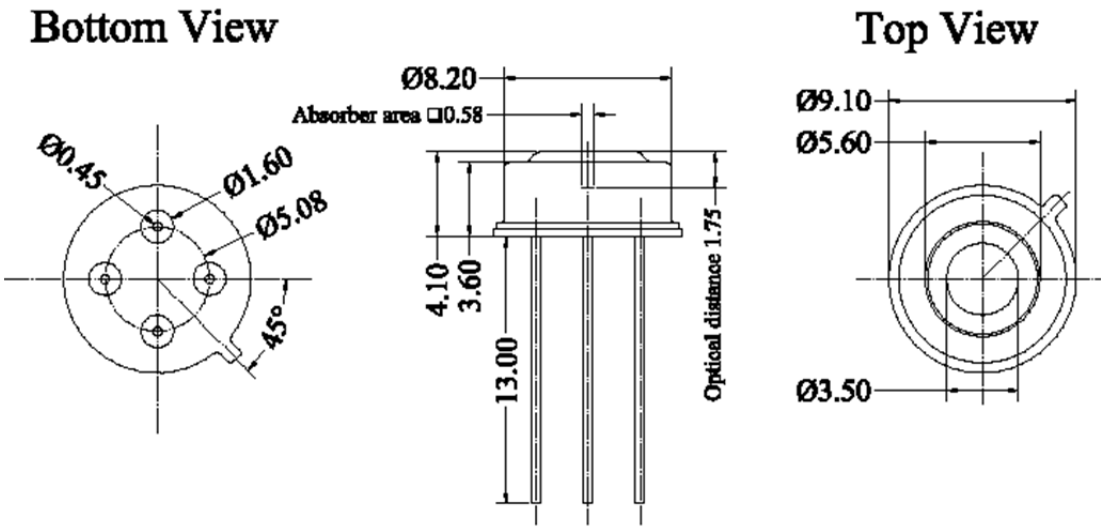

Fig.1 MLX90614 TO-39 package

*Note: All dimensions are in mm

2. Glossary of terms

- SMD –**S**urface **M**ounted **D**evice
- THD – **T**hrough-**H**ole **D**evice
- IR – **I**nfa**r**ed
- PCB – **P**rinted **C**ircuit **B**oard
- TO – **T**ransistor **O**utline

3. Soldering

3.1. Wave soldering

One of the typical methods used for soldering components on PCBs is wave soldering. During the wave soldering a bath is used. In this bath is a quantity of molten solder, which passes across the components, placed on or inserted into the PCB.
There are many types of wave-soldering machines, but their basic components and principles are the same. The main zones are:

- fluxing zone
- preheating zone
- soldering zone
- cleaning zone (optional, dependable of the used flux)

Usually, two solder waves are used. The first solder wave is usually a high, rather narrow wave made turbulent by mechanical means. The wave's flow trajectory is usually aimed in the same direction as the board's travel direction. This first turbulent wave is followed by a second wave, which is a asymmetrical laminar wave. The turbulent action of the first wave causes the solder to move in and around all the chip components to help ensure that all solder joints get soldered and unwanted solder bridges are removed. One important consequence for wave soldering is that the temperature of the leads is higher than the temperature of the package, because the PCB acts as shield.
The Melexis sensor MLX90614 is qualified for a wave soldering process according to the EN60749-15 standard with a peak temperature of 260 °C maximum and the peak temperature time is ≤10 sec.

MLCC or other passive components of the IR sensor circuitry should not be considered for wave soldering and placed on the bottom PCB side under TO39 due to thermal shock risk and forming of solder bridges

3.2. Pin-through-paste method for reflow soldering

Diring the last 10 years, the number of through-hole components used on PCBs is rapidly reducing as THDs make wave soldering more expensive. In cases when only a few THDs are necessary, one can choose to use selective wave soldering only for these components. Another way to solder through-hole part efficiently is using the so "Pin-through-Paste" method where the SMD and the THD components are soldered at the same time during reflow soldering. This method includes the following steps: See Fig.2 and Fig.3

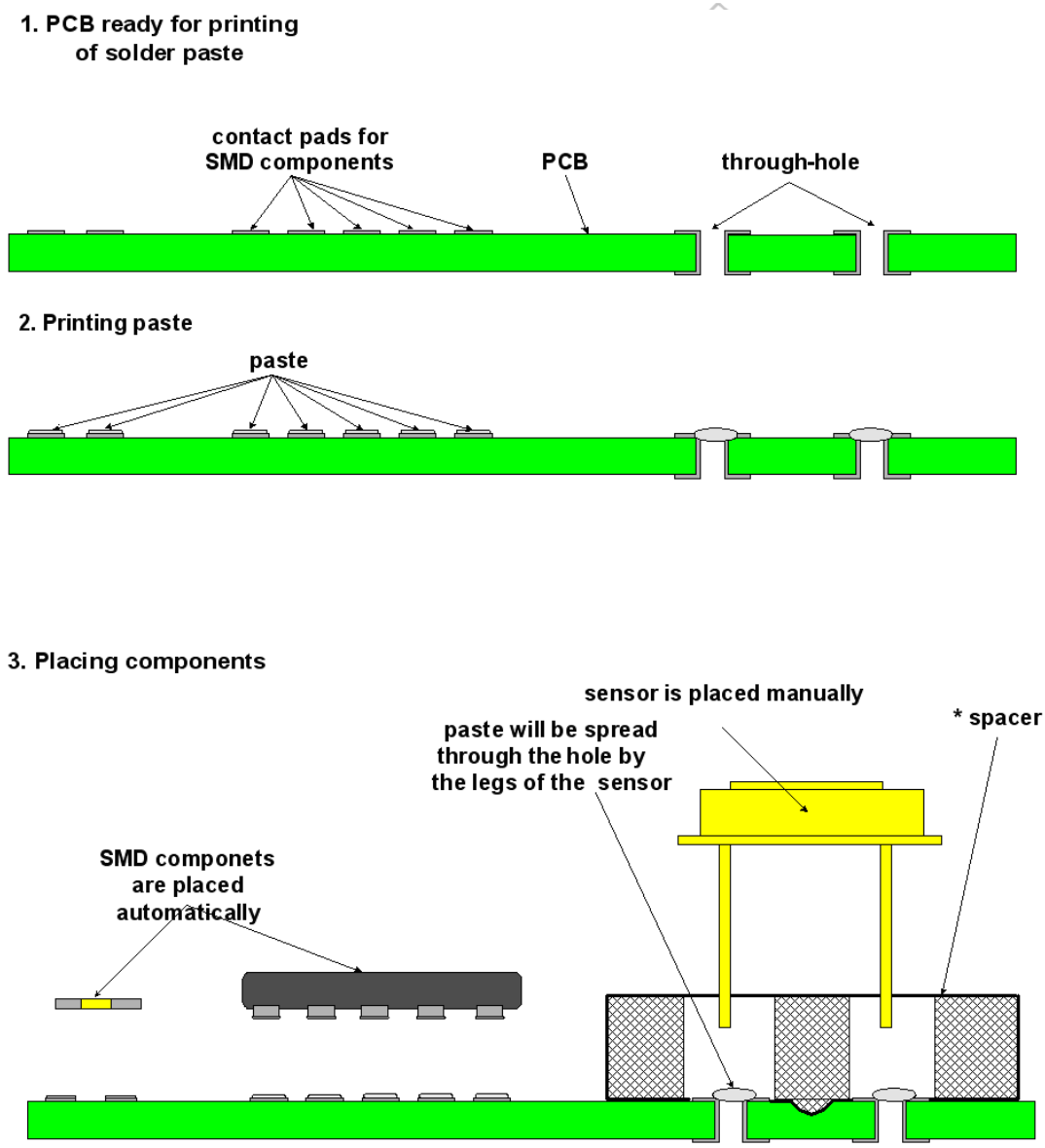

Fig.2 Pin-through-paste preparation procedure for soldering the MLX90614/5 sensor

4. Reflow soldering

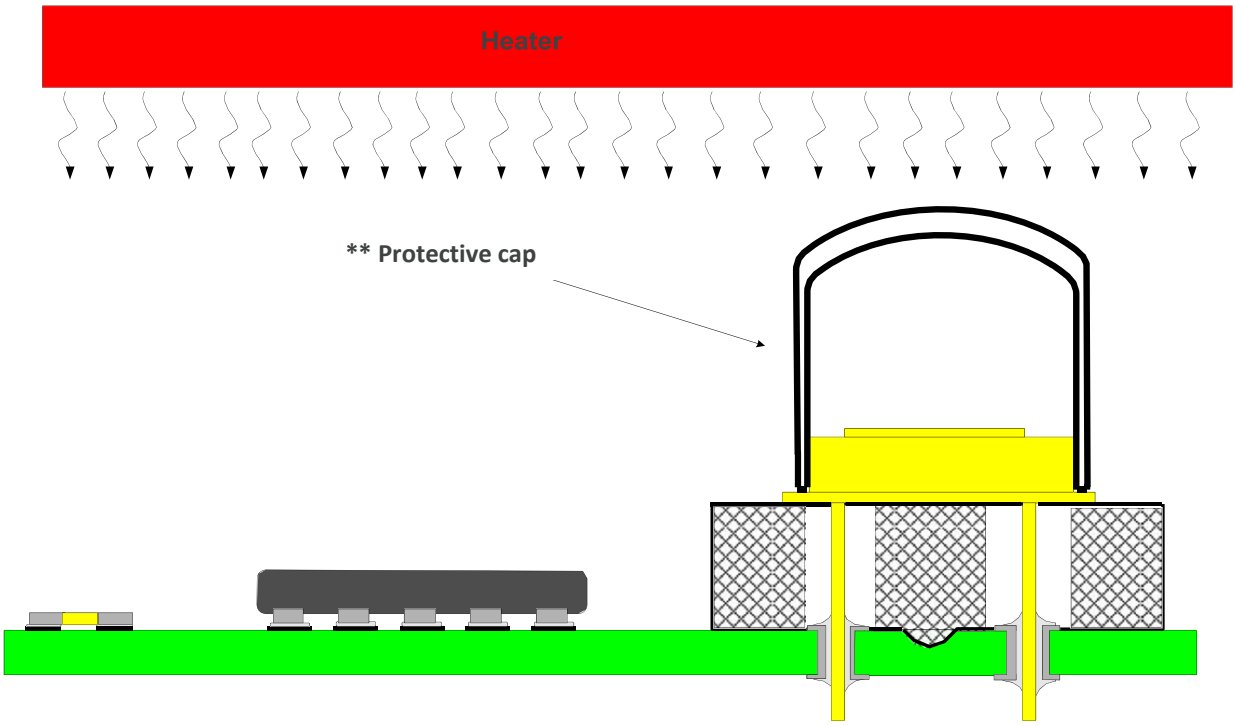

Fig.3 Reflow soldering the Melexis IR sensor

- The solder paste is dispensed (or printed) for all SMDs and on the top of the vias for the THDs;
- SMDs are placed automatically;
- The through-hole part is inserted - for TO39 manually – with the pins in the paste;
- The PCB goes through reflow, soldering both SMD and through-hole parts during the same step;
- For the metal MLX90614 package, it is recommended to have a small spacer on the PCB (See Fig.3-4). This is helpful to avoid solder bridges between the leads and the bottom of the metal TO-39 over the glass insulation. The spacer can be a cross or a flange protection disc made from a high temperature resistant material

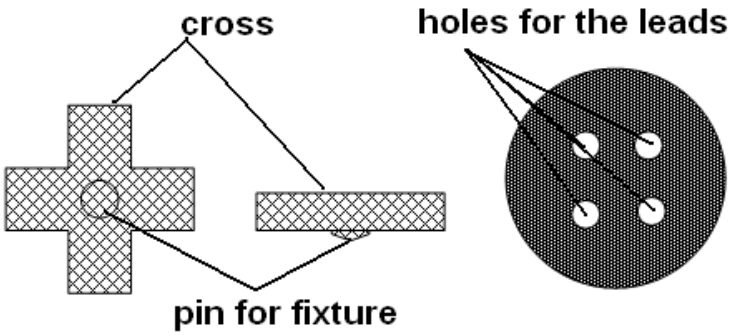

Fig.4 Spacers for IR sensor

The “Pin-through-Paste” method has two consequences:

1. Contrary to the wave soldering, during the “Pin-through-Paste” method the temperature is mostly the same for the whole package as the temperature gradient between the leads and the package is smaller than the gradient during wave soldering.
2. The time of peak heating during the “Pin-through-Paste” method is longer than during wave soldering.

Using an IR reflow process without convection is not recommended, because the TO-39 metal package acts as a shield for the soldering mask on the leads under the package. Only convection reflow should be used. The Melexis IR sensor in TO39 is qualified for reflow soldering according to the J-STD-020 with peak temperature 225°C and peak temperature time ≤30 sec.

If the reflow peak temperature is higher than 225 °C, a thermal shield is required to be placed on the top of TO39 prior to reflow. This can be a reusable cap made from high temperature resistant material like Silicon Rubber. (See Fig.5). The cap prevents overheating of the epoxy glue used to attach the IR filter window to the metal package. The protective cap for the IR sensor can be a ripped cap, a pull-tab flexicap or an Al shield plate

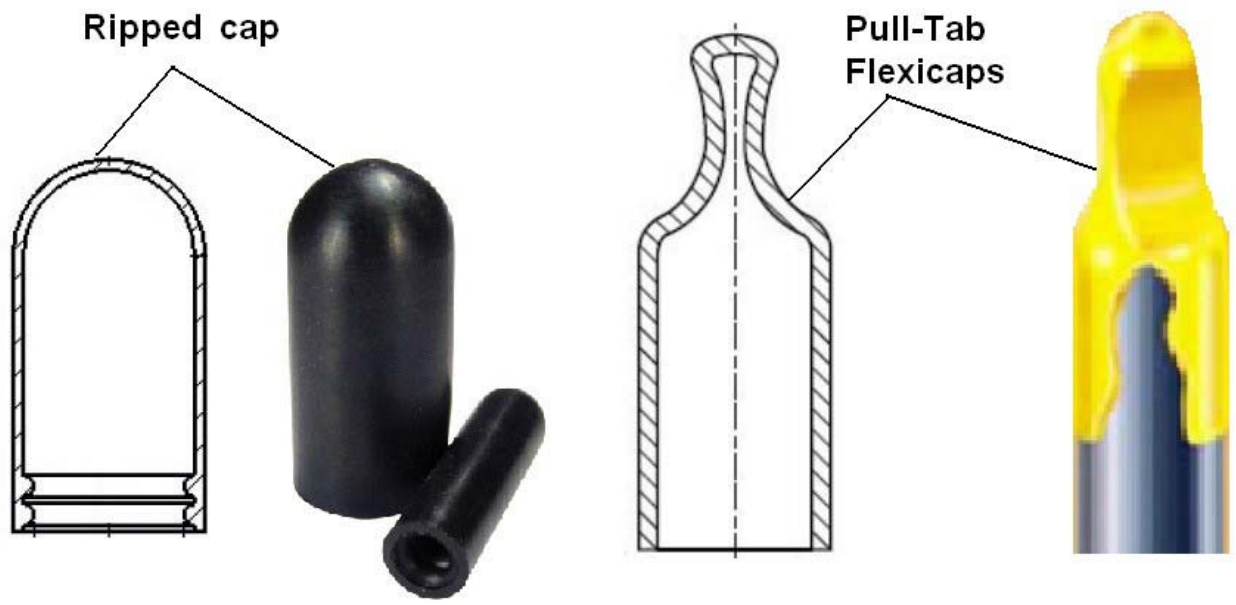

Fig.5 Reflow soldering Melexis IR sensor

3.3. Manual/Robotic iron soldering

Other soldering methods that are used are manual or robotic soldering with soldering irons and hot air guns. The Melexis IR sensor in TO39 is qualified for iron soldering according to the EN60749 -15 with peak temperature 350°C and peak temperature time ≤3.5 sec.

Contact Melexis for details on your reflow temperature profile for a potential risk assessment.

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