

Assembly guidelines for CCS811

Product Overview

The CCS811 series die construction consists of a membrane supported by a silicon frame. The membrane is very fragile so is protected from line of sight by the package lid. The sensing material is positioned in the centre of the membrane for optimum performance.

The CCS811 series of products are assembled into a 10 lead 2.7mm x 4mm 0.6mm pitch, LGA package. The package consists of a substrate and a moulded lid which contains apertures to allow the unobstructed flow of ambient air through the package to ensure the MOX sensing element is exposed to the analyte gas.

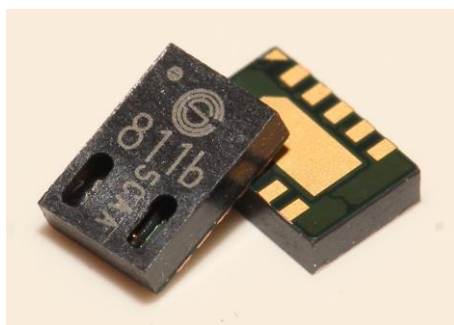


Figure 1 – 2.7 x 4.0 Cavity LGA package

The package technology employed uses standard methods and materials to make it cost effective and scalable in high volume manufacture. Furthermore, the package outline and lead pitch make it ideal for high volume solder mount assembly onto low end PCB technology.

Introduction

This application note offers guidance to the end user on correct handling and assembly of the CCS811 to prevent unnecessary damage to the product. Failure to follow these guidelines may impact performance and/or reliability of the product and, therefore, invalidate any warranties or guarantees.

Key Benefits

- Ultra-low power, high volume silicon based platform
- Small form factor LGA to minimise PCB area
- 10 lead, 0.6mm pitch to provide simple escape routing
- Small cavity provides reduced dead volume to enhance responsivity
- Exposed pad for mechanical stability and thermal grounding

Applications

- High volume consumer applications such as tablets, laptops and smartphones
- Ultra-low power, small form factor gas detection applications such connected home devices

Assembly Considerations

Assembly Environment

The following restrictions should be considered within the assembly environment:-

Ambient temperature: 5°C to 55°C
 Ambient humidity: 5% to 85% RH, non-condensing

Avoid exposure to:-

1. Silicone vapours from sources such as silicone adhesives, silicone rubber, silicone sealant, silicone gel, HMDS, oils including hair gels and oils.
2. Corrosive gases and vapours such as chlorine, hydrochloric acid, sulphur oxides for example some flux vapours
3. Acids, solvents and other liquids, including water, especially where the water contains ionic contamination such as salts
4. Particulates and dust
5. Long term extremes, for example high humidity and/or temperature extremes for extended periods
6. Vibration, for example ultrasonic, pneumatic tools
7. Mechanical or thermal shocks

Assembly Process

The cavity LGA package is designed for high volume pick and place type processing. The environment should be managed in accordance with the above criteria. The process should be managed in accordance with the below criteria.

The assembly line should make the following provisions:-

1. Fluxes should be sufficiently dried to prevent significant outgassing
2. Tape feeders should avoid excessive vibration
3. Pick up tools should avoid excessive force, sudden mechanical shock and excessive vacuum
4. Pick up tools should avoid picking over the exposed areas (open cavities)
5. Automated reflow (for example infrared oven, vapor phase system etc.) is recommended using a lead-free reflow profile as indicated in the next section
6. The part should be subjected to a maximum of 3x reflow profiles
7. Flux cleans should be avoided
8. High pressure air cleans should be avoided
9. Ultrasonic bonding should be avoided
10. ESD precautions should be taken

Floor Life

Refer to the CCS811 datasheet for the package MSL rating. Note that the MOX sensing element can be contaminated and/or poisoned so consideration should be made regarding the environment to which open packages are exposed. See later section regarding assembly environment guidelines.

Typical Lead Free Reflow Profile

The following profile is given by way of example and the exact conditions will vary depending on the SMT materials and equipment but maximums must not be exceeded.

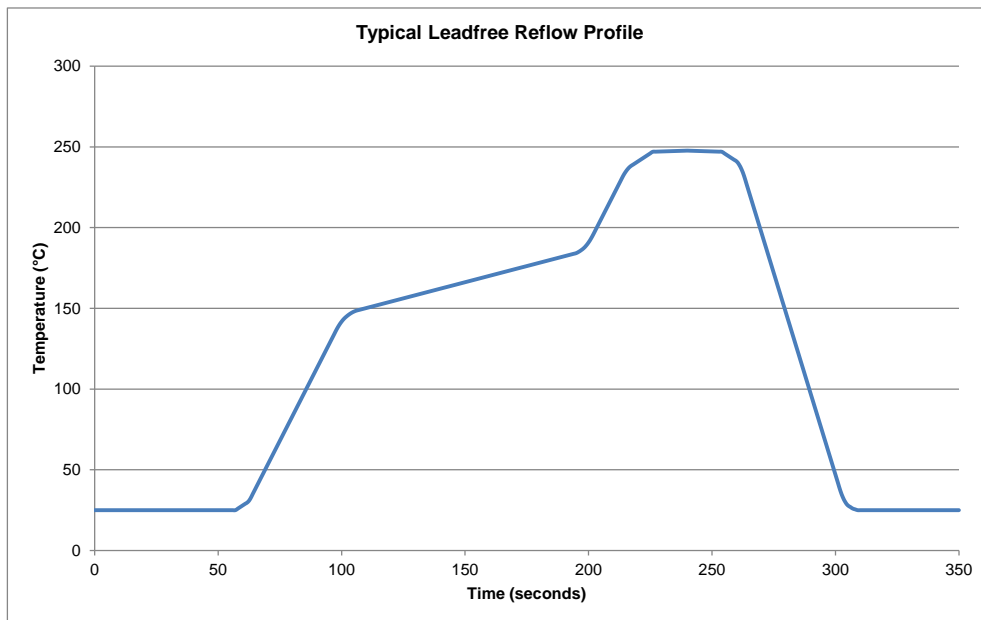


Figure 2 – Typical Reflow Profile

Profile Conditions:-

Item	Specification
Initial Ramp	<3°C/sec to 150°C ± 5°C
First soak	150~190°C for 60~120 seconds
Second Ramp	<3°C/sec to peak
Time above liquidus (217°C)	40~90 seconds
Peak temperature	250°C ± 5°C
Cool rate	<6°C/sec

Abbreviations

Abbreviation	Description
CMOS	Complementary Metal Oxide Semiconductor
LGA	Land Grid Array
ESD	Electro Static Discharge
MEMS	Micro Electro Mechanical System
MOX	Metal Oxide
MSL	Moisture Sensitivity Level
PCB	Printed Circuit Board
RH	Relative Humidity
SMT	Surface Mount Technology

References

Ref	Description
CC-000619-DS	Datasheet for CCS811
CC-000783-AN	Mechanical considerations for CCS811

The contents of this document are subject to change without notice. Customers are advised to consult with Cambridge CMOS Sensors (CCS) Ltd sales representatives before ordering or considering the use of CCS devices where failure or abnormal operation may directly affect human lives or cause physical injury or property damage, or where extremely high levels of reliability are demanded. CCS will not be responsible for damage arising from such use. As any devices operated at high temperature have inherently a certain rate of failure, it is therefore necessary to protect against injury, damage or loss from such failures by incorporating appropriate safety measures