Component Heat Resistance to Lead-Free Reflow Soldering

1. SCOPE

This specification, based on IPC/JEDEC JSTD020D, defines the test procedure and criteria for assessing acceptability of components for use in lead-free reflow soldering processes.

2. EQUIPMENT

- Microscopes - Optical microscopes capable of 30X magnification for external inspection.
- Dimensional Measurement Instruments - Tools/instruments used for measuring dimensions shall be capable per standard GR&R qualification methods. Measurement microscopes, calipers and go/no-go gauges are acceptable.
- Temperature/Humidity Chambers - Chambers shall be capable of operating at 85°C and 85% Relative Humidity (RH). Within the chamber working area, temperature tolerance shall be ± 2°C and the RH tolerance shall be ± 3% RH.
- Solder Reflow Equipment - A full convection reflow system capable of maintaining the reflow profiles required by this test is preferred. If Infrared (IR)/convection systems are used, ensure that the IR is used to heat the air only and not directly impinge on the connector housing.

3. PROCEDURE

3.1. Specimen Requirements

Unless otherwise specified in the referencing document, select a minimum of 5 specimens for each reflow profile being tested.

| 3.2. Test Method A: Exposure With Moisture Soak Preconditioning

| A. Initial Visual Inspection and Optional Dimensional Measurement

| Conduct a visual inspection of all plastic housings under 30X magnification for evidence of physical | damage detrimental to product performance.

| B. Optional Dimensional Measurement

| **NOTE** *As stated, dimensional inspections are optional, however, they are recommended for* | *applications where critical to performance dimensions may be affected by creep, sag or* | *distortion of the plastic during thermal excursions.*
|
| Using a qualified measurement tool/instrument, measure and record the dimensions specified in | the referencing document.

| C. Moisture Soak

Place specimens in a clean, dry, shallow container so that they do not touch or overlap each other. Subject the specimens to 85°C and 85% RH for 168 hours.

D. Reflow Soldering Simulation

1. Set up Conditions

All connector product specimens must be placed on a Printed Wiring Board (PWB) or a ceramic substrate 0.889 mm [.035 in] thick in multiple orientations as in their intended use. The reflow oven atmosphere shall be composed of ambient air (as opposed to nitrogen). Unless otherwise specified, the temperatures required for the test exposures shall be measured on the top of the component.

2. Exposure Conditions

a. Condition A - Peak Reflow - 245°C

Remove specimens from the moisture soak and store at room temperature for 15 minutes. No longer than 4 hours after removal from the temperature and humidity exposure, subject the specimens to three (3) cycles of the following reflow profile:

- Average ramp rate: 3°C per second maximum
- Preheat temperature (minimum): 150°C
- Preheat temperature (maximum): 200°C
- Preheat time: 60 to 180 seconds
- Ramp to peak: 3°C per second maximum
- Time over liquidus (217°C): 60 to 150 seconds
- Peak temperature: 245 +0/-5°C
- Time within 5°C of peak: 10 to 30 seconds
- Ramp - Cool Down: 6°C per second maximum
- Time 25°C to Peak: 8 minutes maximum

NOTE *Allow specimens to cool to room ambient between cycles.*

b. Condition B - Peak Reflow - 260°C

Remove specimens from the moisture soak and store at room temperature for 15 minutes. No longer than 4 hours after removal from the temperature and humidity exposure, subject the specimens to three (3) cycles of the following reflow profile:

- Average ramp rate: 3°C per second maximum
- Preheat temperature (minimum): 150°C
- Preheat temperature (maximum): 200°C
- Preheat time: 60 to 180 seconds
- Ramp to peak: 3°C per second maximum
- Time over liquidus (217°C): 60 to 150 seconds
- Peak temperature: 260 +0/-5°C
- Time within 5°C of peak: 20 to 40 seconds
- Ramp - cool down: 6°C per second maximum
- Time 25°C to peak: 8 minutes maximum

NOTE *Allow specimens to cool to room ambient between cycles.*

E. Final Visual Inspection and Optional Dimensional Measurement

1. Visual Inspection

Conduct an inspection of all plastic housings under 30X maximum magnification and note any blisters, deformation/warpage, melting or physical damage detrimental to product performance.

2. Optional Dimensional Measurement

Using a qualified measurement tool/instrument, measure and record the dimensions and verify any other functions or properties specified in the referencing document.

3.3. Test Method B: Exposure Without Moisture Soak Preconditioning

A. Initial Visual Inspection and Optional Dimensional Measurement

Conduct a visual inspection of all plastic housings under 30X magnification for evidence of physical damage detrimental to product performance.

B. Optional Dimensional Measurement

Using a qualified measurement tool/instrument, measure and record the dimensions specified in the referencing document.

C. Reflow Soldering Simulation

1. Set up Conditions

All connector product specimens must be placed on a Printed Wiring Board (PWB) or a ceramic substrate 0.889 mm [.035 in] thick in multiple orientations as in their intended use. The reflow oven atmosphere shall be composed of ambient air (as opposed to nitrogen). Unless otherwise specified, the temperatures required for the test exposures shall be measured on the top of the component.

2. Exposure Conditions

a. Condition A - Peak Reflow - 245°C

Subject the specimens to three (3) cycles of the following reflow profile:

- Average ramp rate: 3°C per second maximum
- Preheat temperature (minimum): 150°C
- Preheat temperature (maximum): 200°C
- Preheat time: 60 to 180 seconds
- Ramp to peak: 3°C per second maximum
- Time over liquidus (217°C): 60 to 150 seconds
- Peak temperature: 245 +0/-5°C
- Time within 5°C of peak: 10 to 30 seconds
- Ramp - Cool Down: 6°C per second maximum
- Time 25°C to Peak: 8 minutes maximum

NOTE *Allow specimens to cool to room ambient between cycles.*

b. Condition B - Peak Reflow - 260°C

Subject the specimens to three (3) cycles of the following reflow profile:

- Average ramp rate: 3°C per second maximum
- Preheat temperature (minimum): 150°C
- Preheat temperature (maximum): 200°C
- Preheat time: 60 to 180 seconds
- Ramp to peak: 3°C per second maximum
- Time over liquidus (217°C): 60 to 150 seconds
- Peak temperature: 260 +0/-5°C
- Time within 5°C of peak: 20 to 40 seconds
- Ramp - cool down: 6°C per second maximum
- Time 25°C to peak: 8 minutes maximum

NOTE *Allow specimens to cool to room ambient between cycles.*

D. Final Visual Inspection and Optional Dimensional Measurement

1. Visual Inspection

Conduct an inspection of all plastic housings under 30X maximum magnification and note any blisters, deformation/warpage, melting or physical damage detrimental to product performance.

2. Optional Dimensional Measurement

Using a qualified measurement tool/instrument, measure and record the dimensions and verify any other functions or properties specified in the referencing document.

3.4. Inspection Criteria

Note if any of the following occur:

- The plastic housing blisters after reflow soldering simulation.
- The plastic housing melts after reflow soldering simulation.
- Significant discoloration of any portion of the product including plastic materials, platings and contacts.
- Any critical to function performance metric for the product does not meet the product specifications.
- Any change in measured dimensions from initial to final.

4. REFERENCING DOCUMENT

The following shall be specified in the referencing document:

- Test specimen preparation, if other than specified herein.
- Specimen description.
- Specimen drawing with at least 3 dimensions (typically overall length, width and height) of interest highlighted, if the optional dimensional inspection is to be performed.
- Test condition to be used:
  - Test Method A - With Moisture Soak
  - Test Method B - Without Moisture Soak
  - Condition A - Peak Reflow, 245°C
  - Condition B - Peak Reflow, 260°C

5. TEST REPORT

The test report shall contain the following:

- Test method used (245 or 260°C maximum temperature)
- Thermal profile
- If required, measured dimensions and changes in critical to function properties.