



Application Note

***Lead-Free Solder
Reflow: Packaging***

AN016104-0406



This publication is subject to replacement by a later edition. To determine whether a later edition exists, or to request copies of publications, contact:

ZiLOG Worldwide Headquarters

532 Race Street
San Jose, CA 95126
Telephone: 408.558.8500
Fax: 408.558.8300
www.zilog.com

ZiLOG is a registered trademark of ZiLOG Inc. in the United States and in other countries. All other products and/or service names mentioned herein may be trademarks of the companies with which they are associated.

Information Integrity

The information contained within this document has been verified according to the general principles of electrical and mechanical engineering. Any applicable source code illustrated in the document was either written by an authorized ZiLOG employee or licensed consultant. Permission to use these codes in any form, besides the intended application, must be approved through a license agreement between both parties. ZiLOG will not be responsible for any code(s) used beyond the intended application. Contact the local ZiLOG Sales Office to obtain necessary license agreements.

Document Disclaimer

©2006 by ZiLOG, Inc. All rights reserved. Information in this publication concerning the devices, applications, or technology described is intended to suggest possible uses and may be superseded. ZiLOG, INC. DOES NOT ASSUME LIABILITY FOR OR PROVIDE A REPRESENTATION OF ACCURACY OF THE INFORMATION, DEVICES, OR TECHNOLOGY DESCRIBED IN THIS DOCUMENT. ZiLOG ALSO DOES NOT ASSUME LIABILITY FOR INTELLECTUAL PROPERTY INFRINGEMENT RELATED IN ANY MANNER TO USE OF INFORMATION, DEVICES, OR TECHNOLOGY DESCRIBED HEREIN OR OTHERWISE. Except with the express written approval ZiLOG, use of information, devices, or technology as critical components of life support systems is not authorized. No licenses or other rights are conveyed, implicitly or otherwise, by this document under any intellectual property rights.

Application Notes are tested with the version of ZDS II available at the time of release. Subsequent releases of ZDS II may require you to modify Application Note code to restore its function.



Table of Contents

Abstract	1
Product Identifier	1
Qualification	1
Surface Mount Technology (SMT) Reflow Profiles	1
Visual Texture	3

Abstract

In keeping with ZiLOG's commitment to be a responsible steward of the environment, ZiLOG now adds environmentally friendly Green packages to our product portfolio effective June 30, 2003. These packages have lead-free plating and are compliant to the EU RoHS Directive.

Qualified products are available for customer sampling and production needs.

Product Identifier

Green products are identified with a unique ZiLOG product specification index (PSI) environment code **G** for Green packages (for example, Z84C0008FEC becomes Z84C0008FEG, and Z8F0822SJ020SC becomes Z8F0822SJ020SG).

IrDA products are the exception to this because no identifier exists on the package. The conversion is time based. Contact your local ZiLOG sales representative for further clarification on the identification of Green IrDA products.

Qualification

With the exception of IrDA products, ZiLOG packages are classified per JEDEC J-STD-020 for the minimum MSL 3. Reliability tests include 1000x temperature cycles condition C, 336 hour pressure pot, and 1000 hours burn-in.

IrDA products are classified MSL 4. ZiLOG IrDA products are qualified to temperature cycle, temp/humidity, and burn-in IrDA industry standards.

Surface Mount Technology (SMT) Reflow Profiles

A tin/silver/copper (SnAgCu) alloy of SN3.9Ag0.6Cu solder paste is widely accepted by the semiconductor industry because of its lower melting temperature (217 °C), lower cost, and long-term reliability.

The SnAgCu alloy requires higher reflow temperatures versus conventional tin-lead alloy. SMT processes must be optimized to achieve the best yields and reliability.



Table 1 (Copyright IPC/JEDEC, used by permission) describes the classification reflow profiles of tin-lead and lead-free assemblies.

Table 1. Classification Reflow Profile

Profile Feature	Tin-Lead Assembly	Lead-Free Assembly
Average ramp-up rate (T _{max} to T _p)	3 °C/second max.	3 °C/second max
Preheat		
– Temperature Minimum (T _{min})	100 °C	150 °C
– Temperature Maximum (T _{max})	150 °C	200 °C
– Time (t _{min} to t _{max})	60–120 seconds	60–180 seconds
Time maintained above:		
– Temperature (TL)	183 °C	217 °C
– Time (tL)	60–150 seconds	60–150 seconds
Peak/Classification temperature (T _p)	220–225 °C	260 °C
Time within 5 °C of actual peak temperature (t _p)	10–30 seconds	20–40 seconds
Ramp-down rate	6 °C/second max	6 °C/second max
Time 25 °C to peak temperature	6 minutes max	8 minutes max
Notes: 1. All temperatures refer to the top side of the package, measured on the package body surface. 2. It is not recommended that tin-lead product be used with the lead-free solder reflow profile.		

Figure 1 (Copyright IPC/JEDEC, used by permission) is a graphical representation of the solder profiles and associated time and temperatures as defined in Table 1.

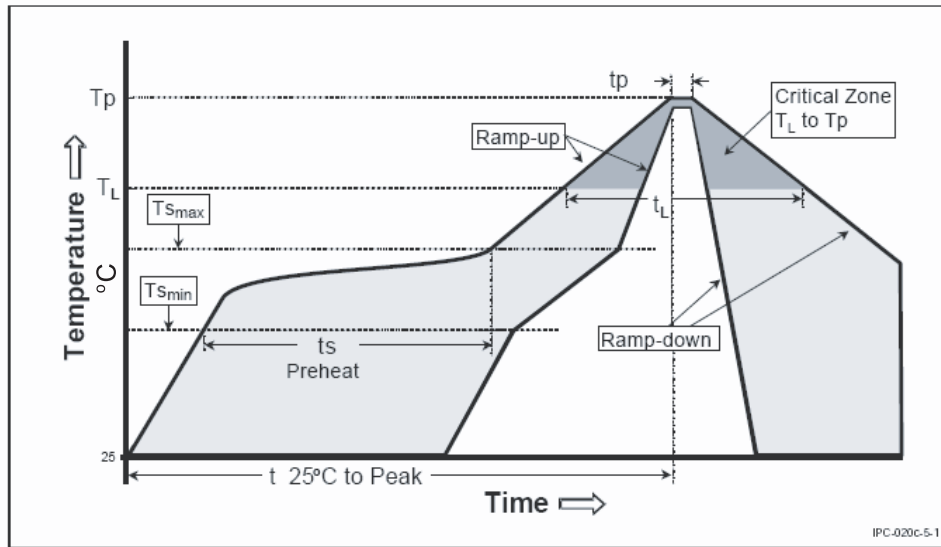


Figure 1. Classification Reflow Profile

Visual Texture

Lead-free solder joints are not as shiny as tin-lead joints. Operators must be able to distinguish lead-free solder joints from tin-lead solder joints.