Technical Note

Recommended Soldering Parameters

Introduction

This technical note defines recommended soldering techniques and parameters to use with Micron products. These techniques and parameters can help prevent possible damage to the semiconductor package during the soldering process. Following these recommended processes helps ensure product quality and reliability.

Table 1: Symbol and Acronym Definitions

Symbol	Definition	Symbol	Definition
Ag	Silver	BGA	Ball grid array
Au	Gold	BLR	Board-level reliability
Bi	Bismuth	NSMD	Non-solder mask defined
Cu	Copper	OSP	Organic solder-ability preservative
Ni	Nickel	PCB	Printed circuit board
Pb	Lead	SAC	Tin (**S**n), Silver (**A**g), Copper (**C**u)
Pd	Palladium	SMT	Surface mount technology
Sn	Tin	VIPPO	Via in pad plated over

Table 2: Solder Ball Alloy Options

Symbol	Definition	Pad Finish	Property	Conditions
SACQ™	Bulk Sn, **4.0 Ag**, 0.5 Cu, 3.0 Bi, 0.05 Ni	Cu + OSP	Stiffest alloy	Optimized for temperature cycle (TC) BLR
SAC405	Bulk Sn, **4.0 Ag**, 0.5 Cu	Ni/Au	Stiffer alloy	Balanced between TC and mobile shock BLR
SAC302	Bulk Sn, **3.0 Ag**, 0.2 Cu	Ni/Au	Standard alloy	Balanced between TC and mobile shock BLR
SAC305	Bulk Sn, **3.0 Ag**, 0.5 Cu	Ni/Au	Standard alloy	Balanced between TC and mobile shock BLR
LF35™	Bulk Sn, **1.2 Ag**, 0.50 Cu, 0.05 Ni	Cu + OSP	Softer alloy	Optimized for mobile shock BLR
SAC105	Bulk Sn, **1.0Ag**, 0.50Cu	Ni/Au	Softer alloy	Optimized for mobile shock BLR

Lead-Frame Plating Options

- Matte Sn, NiPdAu

Table 3: BGA Solder Alloy – General BLR Performance

BGA Alloy	Temperature Cycle	Mobile Shock
SACQ™	↑↑	→
SAC405		
SAC302	↑	→
SAC305		
LF35™	→	↑
SAC105		

Micron Technology, Inc., reserves the right to change products or specifications without notice.
©2017 Micron Technology, Inc. All rights reserved.

Products and specifications discussed herein are for evaluation and reference purposes only and are subject to change by Micron without notice. Products are only warranted by Micron to meet Micron's production data sheet specifications. All information discussed herein is provided on an "as is" basis, without warranties of any kind.

Maximum Soldering Parameters

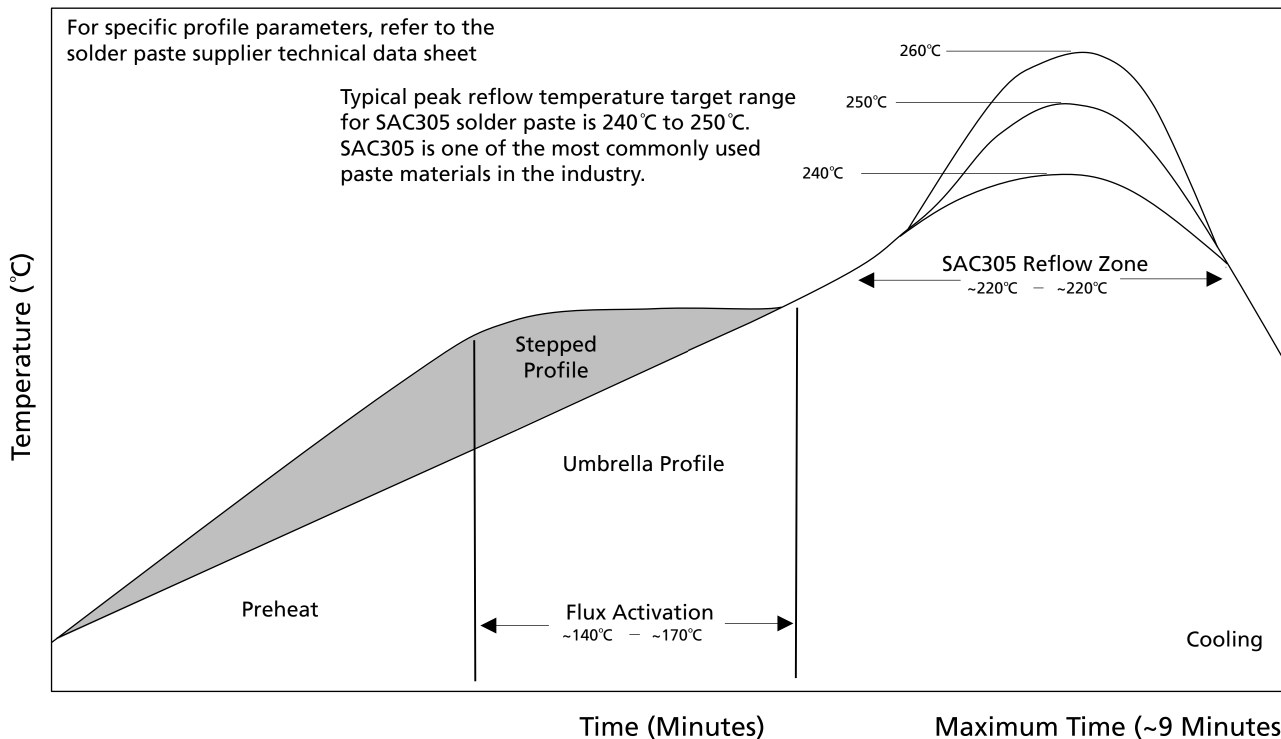
The table below shows the maximum ratings for Micron packages to ensure package integrity through the surface mount process. These maximum ratings apply for all types of soldering processes, including mass assembly, rework, and component removal. The common types of surface mount reflow processes are described and discussed in the following section.

Surface mount reflow parameters are primarily a function of solder paste chemistry and board technology. Therefore, Micron's first-order recommendation is to follow the solder paste supplier's soldering parameters while targeting a peak temperature range of ~20°C to 30°C above the solder paste alloy melting temperature. Peak temperature targets in the 240°C to 250°C range are commonly used for SAC305 surface mount solder pastes.

Table 4: Maximum Soldering Parameters for SMT Reflow

Process	Maximum Peak Temperature (°C)	Maximum Dwell Time at Peak(s)	Maximum Heating Rate (°C/s)	Maximum Cooling Rate (°C/s)	Total Time in Chamber (Minutes)	Number of Reflow Cycles
Pb-free	260	30	3	6	9	3

Figure 1: SMT Reflow Profile Examples



Note: If using paste or solder balls with a low solidus temperature, such as SACQ, Innolot, or other Bi-doped alloys, consider whether profile adjustment/optimization is necessary. Contact your Micron FAE for SACQ solder integration best practices.

Micron Technology, Inc., reserves the right to change products or specifications without notice.
©2017 Micron Technology, Inc. All rights reserved.

The figure and table below show solidus and liquidus temperatures for common alloys used in the electronics industry and in Micron products. All are generally compatible, but the surface mount profile used may need to be adjusted depending on which alloys are combined.

Figure 2: Typical Alloy Melting Temperature Range

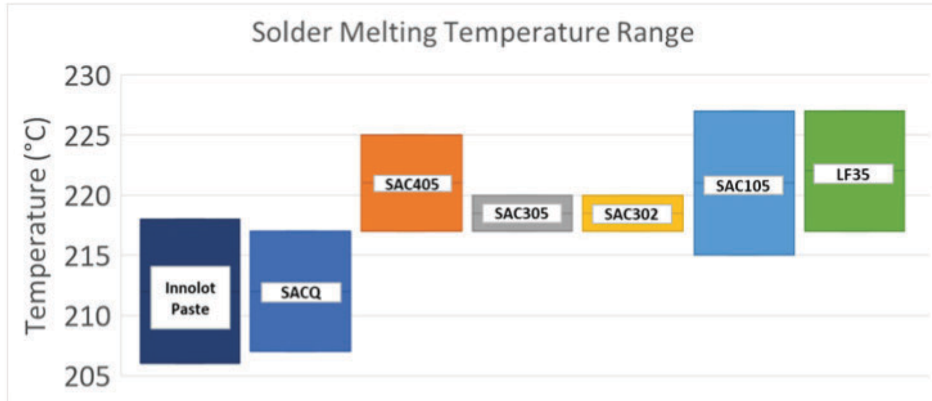


Table 5: Typical Alloy Solidus and Liquidus

Solder Melting Temp (°C)	Innolot	SACQ	SAC405	SAC305	SAC302	SAC105	LF35
Liquidus	218	217	225	220	220	227	227
Solidus	206	207	217	217	217	215	217

Convection Reflow Soldering

Convection reflow uses hot air or nitrogen to heat the assembly to reflow temperature. It is good at heating the product uniformly and at a controlled rate. This is the most common reflow process used today because of its low operational cost, easy and continuous operation, and ability to accurately control the heating and cooling profile. Convection reflow can be used in conjunction with infrared reflow and typically has multiple heating stages, so the assembly is slowly heated to the appropriate temperature.

Wave Soldering

Micron memory ICs are qualified for SMT convection reflow and as such should be mounted only on the topside of a through-hole PCB and not immersed in liquid solder. Process parameters used by wave soldering need to align with the BGA Solder Alloy – General BLR Performance table.

Infrared Reflow

Infrared reflow (IR) is a process where direct IR light sources are used to heat the assembly to the level of reflow temperatures. This was commonly used early in the SMT era.

Micron Technology, Inc., reserves the right to change products or specifications without notice.
©2017 Micron Technology, Inc. All rights reserved.

IR is *not* recommended for mass assembly because reflow temperatures are a function of component color, PCB color, thermal mass, system loading, etc., and more temperature variability is introduced. IR reflow is common for rework, as surrounding components/ areas of an assembly are more easily shielded compared to hot air convection rework tools.

Hand Soldering

Typically, hand soldering is used only on leaded devices to touchup leads with incomplete or poorly formed solder joints. PCB copper loading, iron tip, and heat capacity could have a significant effect on the parameters. The table immediately below summarizes recommendations for leaded packages.

Table 6: Typical Hand Soldering Parameters for Leaded Package or Rework

Maximum Solder from Tip Temperature (°C)	Maximum Contact Time with Component Lead(s)	Number of Heated Cycles
350	20	3

Moisture Sensitivity

Micron floor-life recommendations, based on the moisture sensitivity level of the component, are designed to prevent component damage during reflow processing. The component packaging label lists the rated floor life to follow for each type of component.

Additional Assembly References and Recommendations

- Refer to Micron CSN-33 for BGA pad size recommendations to use for Micron products.
- Refer to IPC-SM-7095 "Design and Assembly Process Implementation for Ball Grid Arrays (BGAs)" for more detailed surface mount process and troubleshooting guidelines.
- For BGA pad type PCB layout, avoid mixing via-in-pad-plated-over (VIPPO) with NSMD pad technology because this can result in hot tears and solder joint cracking due to localized z-axis CTE differentials during reflow.

Micron Technology, Inc., reserves the right to change products or specifications without notice.
©2017 Micron Technology, Inc. All rights reserved.

Revision History

Rev. I – 04/2020

- Updated Figure 1
- Added Figure 2 and Table 5

Rev. H – 02/2020

- Updated Tables 2 and 3

Rev. G – 09/2019

- Updated all sections

Rev. F – 12/2012

- Updated all sections

Rev. E – 07/2006

- Corrected typos
- Revised supplier on page 1
- Corrected punctuation in Note 1, page 2
- Updated tables 1, 2, and 3

Rev. D – 04/2006

- Changed phrase, "J-STD-020" to "the most recent version of J-STD-020"
- Changed MAX Dwell Time to 30s in tables 1 and 2
- Changed "MAX Heating/Cooling Rate" to "MAX Heating Rate" with 3°C/s value in tables 1 and 2
- Added "MAX Cooling Rate" column with 6°C/s value in tables 1 and 2

Rev. C – 12/2004

- Added Note 3 to tables 1 and 2
- Changed MAX Heating/Cooling Rate value to 4°C in table 1

Rev. B – 10/2003

- Reworded some text
- Added CMOS image sensors to all tables
- Changed MAX solder iron tip temperature in table 3 as follows: SnPb from 235°C to 300°C; Pb-free from 260°C to 350°C

Rev. A – 12/2002

- Initial release

8000 S. Federal Way, P.O. Box 6, Boise, ID 83707-0006, Tel: 208-368-3900
www.micron.com/productsupport Customer Comment Line: 800-932-4992
Micron and the Micron logo are trademarks of Micron Technology, Inc.
All other trademarks are the property of their respective owners.

Micron Technology, Inc., reserves the right to change products or specifications without notice.
©2017 Micron Technology, Inc. All rights reserved.