

Packing and Component Performance After Long Term Storage

超长存储产品的包装及元器件 的可靠性评估

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1. Background 背景

As commitment to reliable quality, customer satisfaction, continuous improvement by SG Micro Corp (hereinafter SGMICRO), we are pleased to announce the extending of the shelf life of our products from 2 years to 3 years. During this commitment period, we ensure that all products provided by SGMICRO are in full compliance with JEDEC standards on its quality and reliability requirements.

作为圣邦微电子（北京）股份有限公司（以下简称圣邦）对质量可靠、客户满意、持续改进的承诺，我司经评审决定将产品的 shelf life 由原先的 2 年（24 个月）延长至 3 年（36 个月）。在此承诺期内提供给客户的产品均符合 JEDEC 标准中有关品质和可靠性的要求。

Extending the shelf life will allow SGMICRO to build-ahead on hot parts and hold adequate inventory to meet the sudden surges in demands from our customers. It improves the product availability to our customers while minimizes the negative impact of the shorter shelf life has on us.

延长产品的 shelf life 有利于圣邦提前备货并保持一定的库存，增强客户急需的物料和供货的保证，减少由于 shelf life 过期造成对客户和圣邦的影响。

Shelf Life: The allowable time period after dry packing with MBB (moisture barrier bag) and before removal from MBB. Shelf Life 是指带有真空包装的物料包装完成的时刻开始，在不打开真空包装的情况下，允许存放的最长时间。

2. Scope 范围

This is to evaluate a device packed in reel with MBB that had been stored in warehouse environment (<40°C and <90%RH) for periods of time over 5 years and to identify the aged material.

任意取库存超过5年的产品（存储环境<40°C and <90%RH），验证超长存储物料的品质状况。

Date code restriction is only used to control the products with MSL3. Unlimited storage for MSL1 products under floor life at $\leq 30^{\circ}\text{C}/85\%RH$;

生产周期的限制仅适用于MSL3，即水气敏感类型器件的产品。对于MSL1的产品，产品本身在30°C/85%RH的保存环境下，Floor life没有保存期限的限定要求。（Floor life: 指打开包装后，允许的存放时间）

Remark 备注:

All devices provided by SGMICRO are MSL1 or MSL3 packages.

圣邦目前所有封装类型的产品，其MSL等级为MSL1或MSL3;

All devices provided by SGMICRO are Tape&Reel and packed in Vacuum MBB (Moisture Barrier Bag)

圣邦产品均采用卷带包装及铝箔袋MBB真空包装方式;

Below analysis report is only for the products with MSL3.

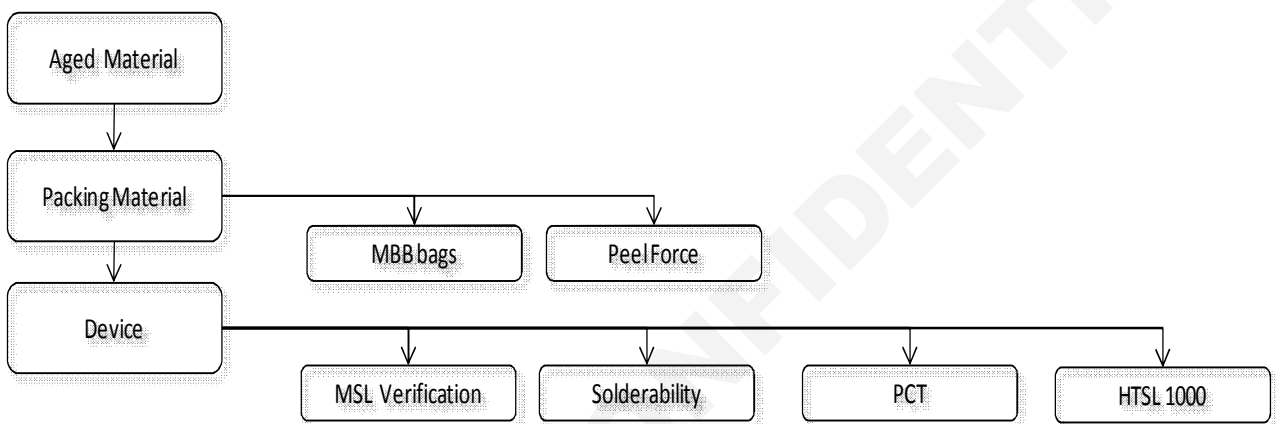
以下分析仅针对圣邦MSL3 的产品;

3. Device Sample 用于评估的样品信息

P/N: SGM8092XS/TR
 PKG: SOIC-8
 MSL: Level 3
 Lot#: B40714.1
 D/C: 2007 (存储周期超5年以上)
 Qty: 2 reels
 Storage: Vacuum MBB seal 铝箔袋真空包装

4. Risk Assessment 风险评估

4.1 Assessment Flow 评估流程



4.2 Assessment for Packing 包装的风险评估

Assessment 评估内容	Inspection Result 检测结果
<p>Vacuum MBB may leak, allow moisture to enter, and cause problems for MSL3 device 热封的铝箔袋真空包装可能存在漏气的情况，即意味着水气进入，影响MSL3的产品。</p>	<p>MBB: A leakage of the vacuum MBB seal would be detected by visual inspection. 漏气的真空铝箔袋包装可以通过外观检验检测出来：以下超出5年的产品真空包装状态完好。</p>  <p>A breach of the vacuum MBB seal would be detected with a color change of the HIC. 破损的真空铝箔袋包装可以通过变色的HIC（湿度指示卡）检测出来：以下超出5年的产品包装中的湿度指示卡未变色</p>



Desiccant Quantity Calculation for the extended storage bags over 5 years.

存储周期5年以上的干燥剂用量计算:

$$U = (0.304 * M * WVTR * A) / D$$

7"盘真空包装干燥剂用量: 33g

13"盘真空包装干燥剂用量: 66g

Peel force may exceed EIA standard, it will cause problems during SMT de-taping.

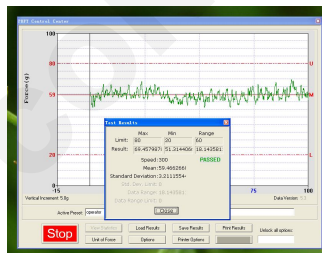
盖带拉力可能会超出EIA标准, 在SMT拉开盖带过程中会造成问题。

Cover tape peel force:

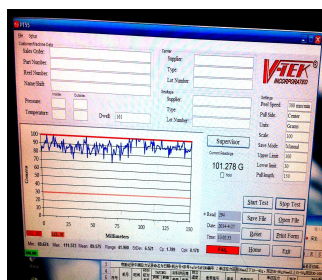
Specific 10~100g peel force for the tape width on 8mm and 12mm.

标准规定8毫米和12毫米的盖带拉力范围在10~100g

Under controlled indoor temperature: 盖带拉力在受控的室内温度条件下(室内温度约20到28℃): 以下超过5年存储期的产品盖带拉力符合要求。

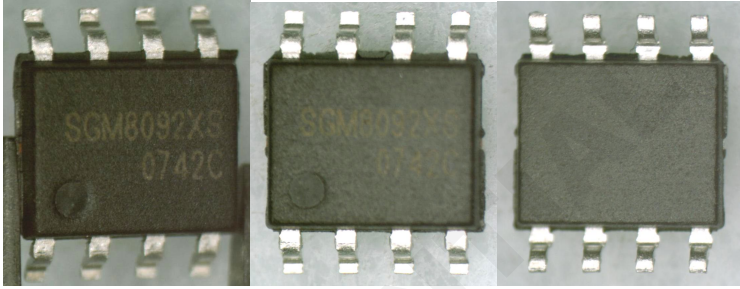
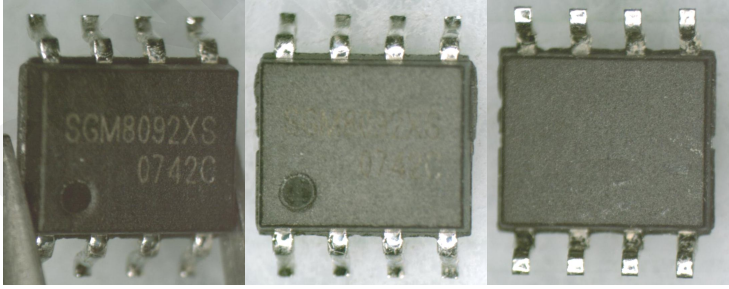
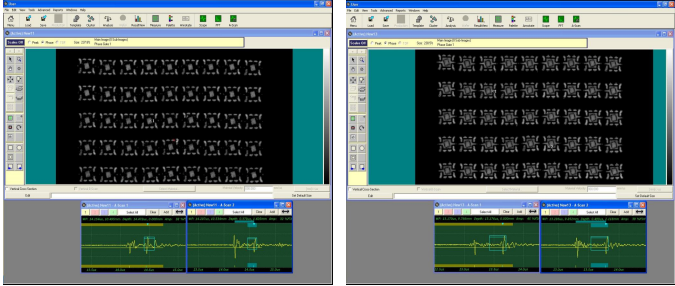


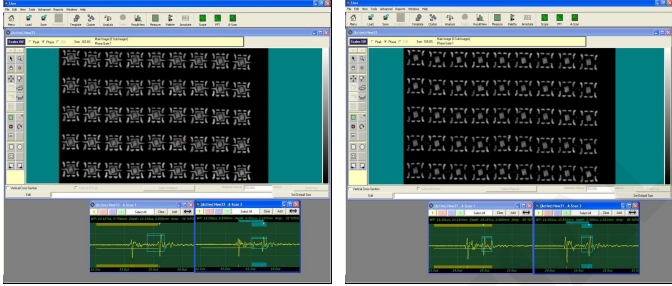
Under uncontrolled indoor temperature. 盖带拉力在不受控的室内温度条件下, 超过5年存储期的产品盖带拉力达到最大上限值。



Tape material manufacturer recommend the material is not able to exposed in uncontrolled indoor temperature above 35℃ for long term
材料供应商建议产品不可长时间暴露于35℃以上的环境中, 盖带粘性在高温的环境下会随着时间增长, 并达到一个上限值。

4.3 Assessment for Device 产品的风险评估

Assessment 评估内容	Inspection Result 检测结果
<p>Long term storage products with pure tin finish lead may oxidize the lead surface. 长期存储的纯锡电镀的产品可能会发生变色、氧化等造成后端SMT焊接过程有焊不上、虚焊等焊接异常。</p>	<p>Lead finish would be detected by visual inspection. 引脚镀层的质量可以通过外观检验进行确认：以下超出5年的产品，其引脚镀层正常，未发现氧化、变色等情况。</p>  <p>Mark Top view Bottom view</p>
<p>Solderability verification needed since long term storage products which the lead surface may impact solder wetting during SMT 易焊性测试评估超长存储的产品,其引脚镀层是否影响SMT焊接贴片 Test condition: 245°C@5seconds after steam aging 8 hrs Test sample: 20 leads Criteria: coverage > 95%</p>	<p>Lead finish under solderability test could be detected by visual inspection. 易焊性验证的结果可以通过外观检验进行确认：以下超出5年的产品，易焊性验证合格，覆盖率达95%以上。</p>  <p>Mark Top view Bottom view</p>
<p>Device functionality and parametric performance 产品各项功能参数指标是否符合要求</p>	<p>All devices passed electrical test. 所有测试的产品，其各项功能参数指标均符合规格要求。</p>
<p>Long term storage products were evaluated with standard JEDEC MSL specification test. 超长存储的产品按照JEDEC标准考核MSL的性能</p>	<p>CSAM image prior to MSL preconditioning. No significant delamination observed. 超长存储产品MSL 预处理之前分层检测，未发现有明显的分层情况。</p> <p>Focus on Die Focus on Lead</p> 

	<p>CSAM image post MSL preconditioning. No significant delamination observed.</p> <p>超长存储产品MSL 预处理后的分层检测，未发现有明显的分层情况</p> <p style="text-align: center;">Focus on Die Focus on Lead</p> 
<p>High Temperature Storage Life Test (HTSL) 高温存储实验</p> <p>Test condition: 150°C@1000h</p> <p>Test sample: 200pcs</p> <p>Criteria: Ac/Rej = 0/1</p> <p>通过高温存储实验,确认超长存储期产品的各项性能参数指标是否符合要求</p> <p>(所有样片均经过预处理MSL确认)</p>	<p>All devices passed electrical test after HTSL qualification</p> <p>所有经过HTSL考核的产品,其各项功能参数指标均合格,符合规格要求。</p> <p>HTOL qualification data provides the best estimate of parametric performance over time. Devices are biased during HTOL testing – This is worse case compared to unbiased storage. (Calculated the product operation life is over 10 years)</p> <p>HTOL (产品量产初期阶段考核项目)的结果是评估产品寿命最佳的依据。HTOL是带偏压的考核项目,考核周期1008小时,其条件比不带偏压的HTSL更苛刻。正常作业条件下的作业寿命远超10年。</p>
<p>Pressure cooker Test (PCT) 高压锅蒸煮实验</p> <p>Test condition: 121°C, 100%RH,15psig(2atm)@96h</p> <p>Test sample: 200pcs</p> <p>Criteria: Ac/Rej = 0/1</p> <p>通过高压锅蒸煮实验,确认超长存储产品的各项性能参数是否符合要求。</p> <p>(所有样片均经过预处理MSL确认)</p>	<p>All devices passed electrical test after PCT qualification</p> <p>所有经过PCT考核的产品,其各项功能参数指标均合格,符合规格要求。</p>

4.4 SUMMARY OF RESULTS 考核结果概述

- Packing assessment result: MSL3包装评估结果
- 超长存储产品,真空包装状态完好;
- 超长存储产品,包装中的湿度指示卡未变色;
- 超长存储产品,包装材料及干燥剂用量理论上可超过5年以上的有效期;
- 超长存储产品,盖带拉力在受控的室内环境温度下(室温25°C),符合EIA标准;但在超出35°C的温度下,盖带粘性会随着温度和时间增长,长期存储粘性超出规范上限值。

- Device assessment result: MSL3等级产品的评估结果
- 超长存储产品, 在包装完好的情况下, 其引脚镀层正常, 未发现氧化、变色等情况。
- 超长存储产品, 易焊性验证合格, 焊料覆盖率达95%以上;
- 超长存储产品, 测试验证合格, 其各项功能参数指标均符合规格要求
- 超长存储产品, MSL 预处理前后分层检测, 未发现有明显的分层情况, 无降低的情况; 符合JEDEC标准要求;
- 超长存储产品, 经过HTSL考核验证, 其各项功能参数指标均合格, 符合规格要求;
- 超长存储产品, 经过PCT考核验证,, 其各项功能参数指标均合格, 符合规格要求。

备注: HTOL (产品量产初期阶段考核项目) 的结果是评估产品寿命最佳的依据。HTOL是带偏压的考核项目, 考核周期1008小时, 其条件比不带偏压的HTSL更苛刻。正常作业条件下的作业寿命远超10年。

4.5 Conclusion 结论

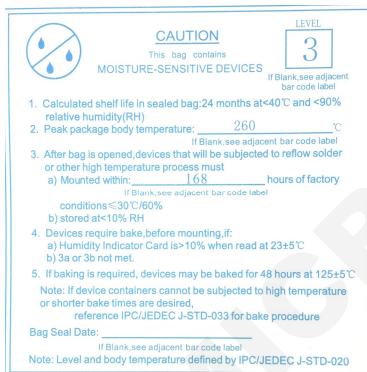
The shelf life of bags control moisture levels and product with MSL3 determined by optical microscopy, MSL performance, solderability and reliability verification is over 5 years.

圣邦通过对超长存储产品的包装及包装材料、产品的易焊性、MSL等级确认, 以及产品的可靠性评估结果表明, MSL3的产品在包装完好的情况下, 存储周期可以达到5年以上, 产品性能不变, 完全符合圣邦对3年存储有效期的产品质量和可靠性的要求。

Remark 备注

MSL3 caution label is the general label, above evaluation result does not conflict with label description.

MSL3产品注意标签为通用标签格式, 以上评估结果与标签内容不冲突。



The image shows a template for an MSL3 Caution Label. It includes a 'CAUTION' header, a 'LEVEL 3' indicator, and a list of handling instructions. The instructions cover shelf life, peak temperature, reflow soldering, and baking procedures. A note at the bottom states that the level and body temperature are defined by IPC/JEDEC J-STD-020.

CAUTION
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL
3

1. Calculated shelf life in sealed bag: 24 months at 40°C and <math><90\%</math> relative humidity (RH)

2. Peak package body temperature: 260 $^{\circ}\text{C}$

3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must

a) Mounted within: 168 hours of factory

4. Devices require bake, before mounting, if:

a) Humidity Indicator Card is >10% when read at 23+5 $^{\circ}\text{C}$

b) 3a or 3b not met.

5. If baking is required, devices may be baked for 48 hours at 125+5 $^{\circ}\text{C}$

Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date:

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

5. Relative Documents 参考文件

1. JEDEC: "J-STD-033 handling, packing, shipping and use of moisture/reflow sensitive surface mount devices"
2. R.R. Madsen "component reliability after long term storage" (May, 2008 TI)