New assembly process sequence in SOIC 18 lead for devices assembled in CIRTEK including single DTFS tool (Deflash, Trim, Form and Singulation)

Qualification summary report

General Information – Test Vehicles	
Commercial Product	*: M41Txx real-time clock (RTC)*
Product Line	*: 41T81 / BHLB61*
Product Description	*: Real-time clock (RTC) Family*
Package	*: SOIC 18 LEADS*
Silicon Technology	*: HCMOS4*
Division	*: AMS*

Traceability	
Diffusion Plant	*: SINGAPORE Ang Mo Kio*
Assembly Plant	*: CIRTEK Elecctronics Corp., Philippines*

Qualification Assessment	
Pass	☒
Fail	☐
Investigation required	☐

1 GENERAL INFORMATION

1.1 What

Progressing on the activities related to our service continuous improvement, ST is glad to announce the introduction of a new assembly process sequence for ST SOIC 18 leads devices assembled in CIRTEK, Philippines as additional option to increase the volume loading in assembly line. The difference in process sequence is reported here below:

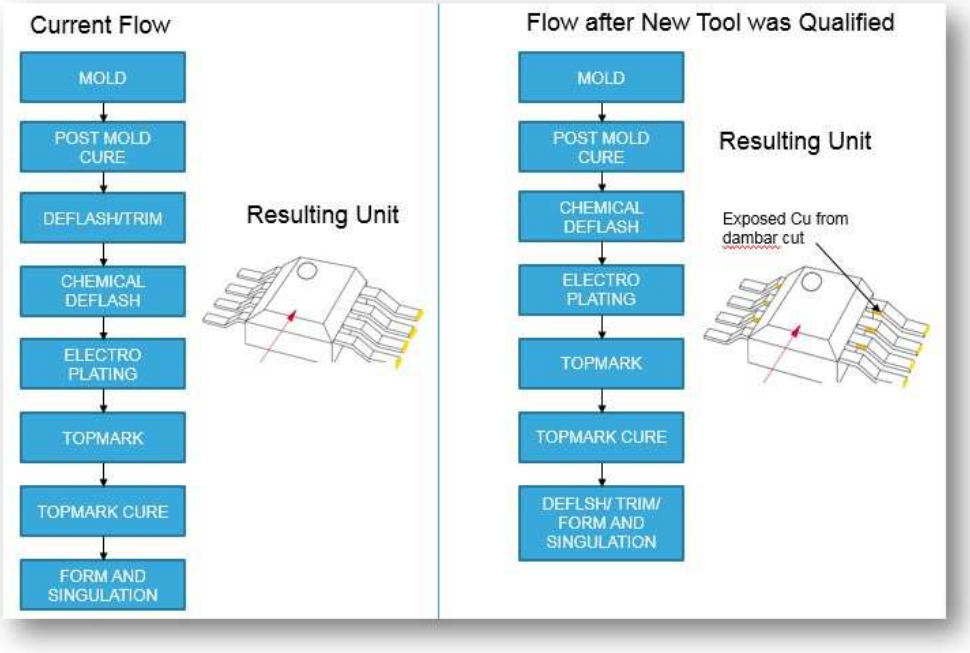
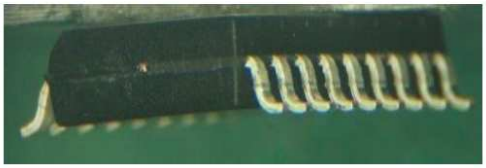


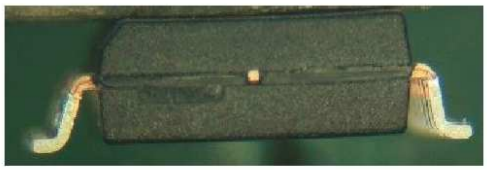
Photo of unit using OLD DTF tool

End Side View

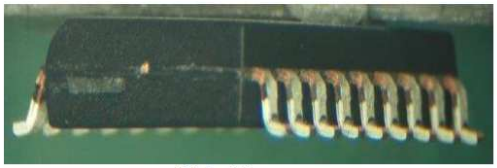


Side View

Photo of unit using NEW DTFS tool



End Side View



Side View

Remarks:

- ✓ The unit processed using OLD DTF machine does not exhibit exposed copper on shoulder area of the leads
- ✓ The unit processed using the NEW DTFS machine exhibit exposed copper on shoulder area of the leads
- ✓ Units processed using both OLD and NEW DTFS machine passed and met ST specs requirement.

1.2 Why

This change will contribute to ST's continuous service improvement and ensure a consistent assembly process on SOIC 18L assembly production line in CIRTEK.

1.3 Who

M41T81S, M41T83 and M41T93 real-time clock (RTC) devices in SOIC 18 leads with embedded crystal. See list of CP for details.

1.4 How

The qualification program consists mainly of comparative measurements and MSL1 reliability assessment

2 QUALIFICATION OVERVIEW

The objective of this qualification is to qualify the new assembly process sequence in SOIC18 lead including single DTFS tool (Deflash, Trim, Form and Singulation), for devices assembled in CIRTEK Elecctronics Corp., Philippines.
The qualification plan is based on:

- 100% visual inspection on good units trough 10-40x magnification microscope to check for possible rejects on defect criteria
- Dimensional measurements (stand off, lead length, foot length and lead spread)
- Solderability Test
- Reliability MSL1 assessment (including CSAM to check for delamination)

2.1 Conclusion

All qualification tests have been completed with positive results.
Based on the overall results obtained, the new process flow can be used as additional process sequence to increase the capacity.

3 QUALIFICATION RESULTS

Table 1 – Result summary

Item	Conditions	Sample size (pcs)	Remarks
Visual Inspection	Chip Out Crack Microgap Damage Leads Burrs	56	Passed criteria – No Abnormalities were observed
Package dimension	Stand-off Lead length Foot length Lead spread	30	Passed with results aligned to current process option in terms of dimensional data and cpk
Solderability Test	245°C ±5°C; 16 hrs steam aging Comp: 96.5%/3%/0.5% Sn/Ag/Cu	25	Passed – No Abnormalities were observed
MSL 1 Preconditioning	IPC/JEDEC-J-STD-020E	22	Passed – No Delamination observed

4. ANNEXES

MSL Classification Report For

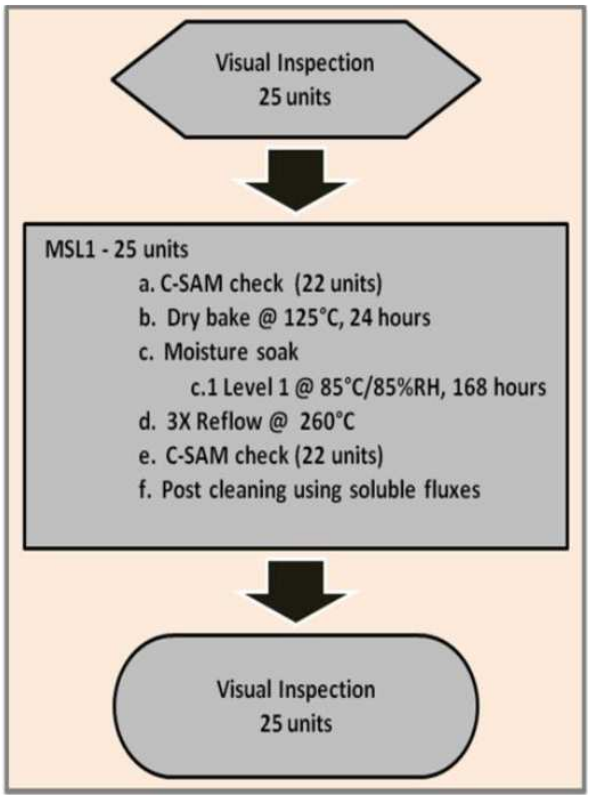
Package Type : **18L SOWB**
Test Vehicle: **M41T83RMY6F**
Raw Line: **BS2O*B6LA83R**
Finished Good: **M41T83RMY6DT$S4**

Report number: **MSL-STM225-18-037**
Date: **December 09, 2018**

Background: MSL1 Classification for **18L SOWB** package with **BS20*B6LA83R** device. Samples were subjected to MSL 1 @ 260°C peak temp, 3x reflow.

1.0 PURPOSE:
Moisture Sensitivity Level assessment for **18L SOWB** package with **BS2O*B6LA83R** device for new assembly process sequence with DTFS tool qualifications. Samples were subjected to MSL 1 classification @ 260°C peak temp, 3x reflow.

2.0 TEST PERFORMED/ PROCEDURE:
The samples were evaluated using IPC//JEDEC-020E.



3.0 SAMPLE DESCRIPTION / INFORMATION:

Assembly Site		Cirtek Elec. Corp.
Package Type		18L SOWB
Device #		BS20*B6LA83R
Lot #		68269P0 #01
Die Size		Not Provided
Lead frame:	Type / Material	Copper
	Supplier	Not Provided

4.0 EVALUATION RESULTS SUMMARY:

4.1 MSL 1 Classification Preconditioning (IPC/JEDEC-J-STD-020E)

Package	Pre - MSL Delamination Check	Post - MSL Delamination Check	Visual Inspection result
	Rej/ S-Size	Rej/ S-Size	Rej/ S-Size
18L SOWB	0/22	0/22	0/25

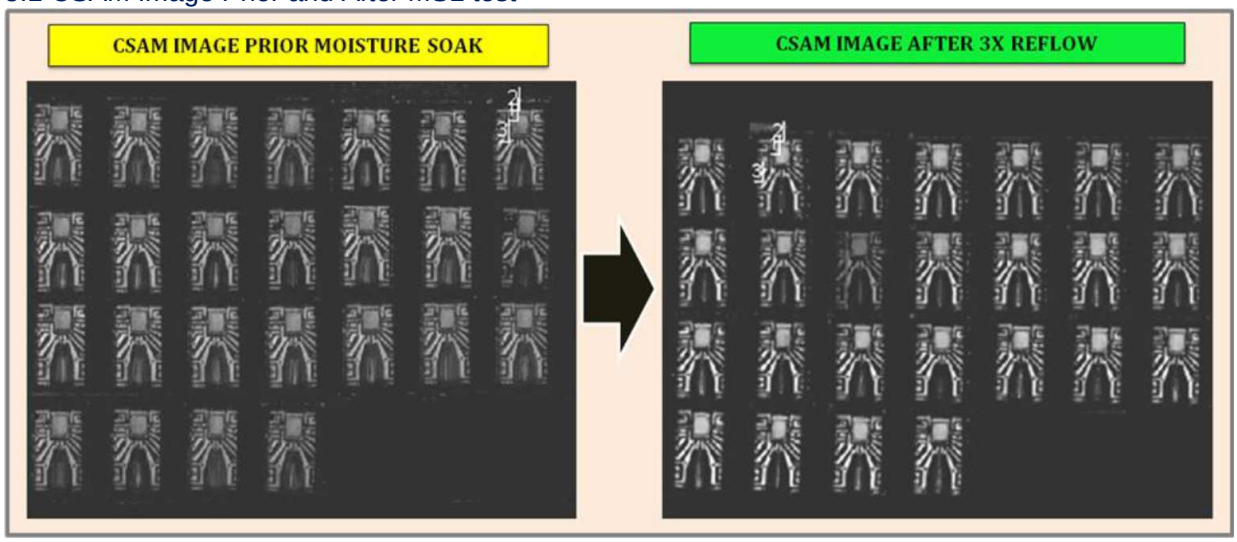
4.2 Scanning Acoustic Microscopy Inspection Criteria and Result

SAM Inspection Items	Result (Rej/S-size)		Remarks
	Prior to M-Soak	After Reflow	
a. Delamination on the active side of the die. /Any evidence	0/22	0/22	Passed
b. Delamination on wire bonding surface.(downbond area[1] & leads/posts) /Any evidence	0/22	0/22	Passed
c. Delamination change along any polymeric film bridging any metallic features that is designed to be isolated. />10%	N/A		
d. Delamination/cracking on the die attach area (for thermally enhanced packages or device that require electrical contact to the backside of the die. >50%	0/22	0/22	Passed
e. Delamination on surface-breaking feature (lead fingers, tie bars, heat spreader alignment features, heat slugs, etc) /Delaminated over entire length.	0/22	0/22	Passed

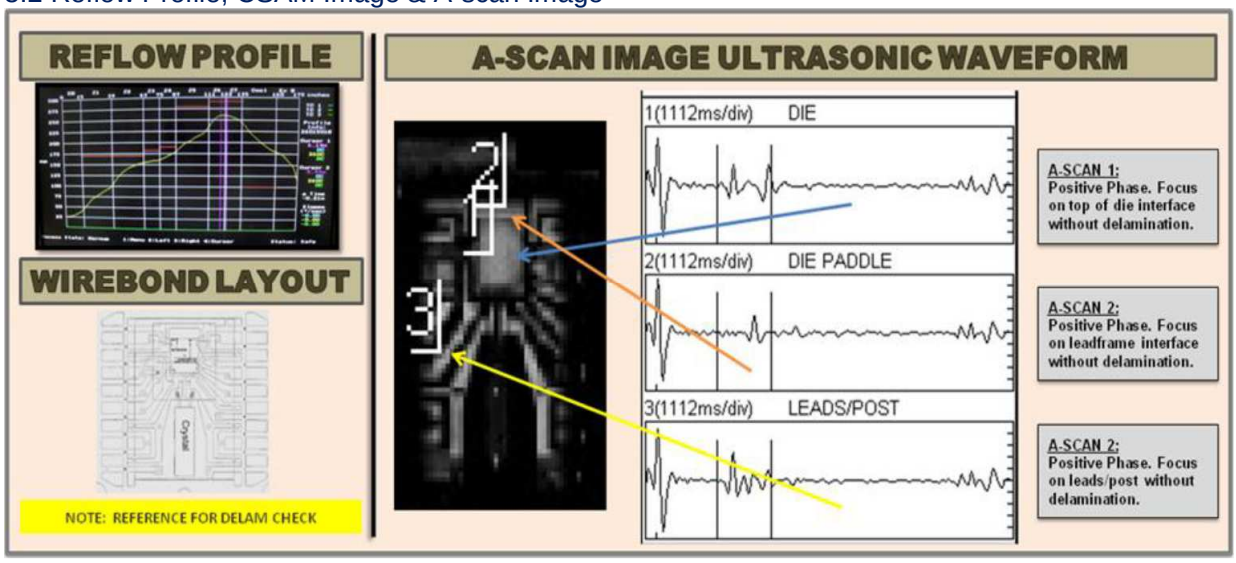
Note: Above delamination criteria are from 6.2.1.1 of IPC/JEDEC J-STD-020E.
Note 1: Downbond area- an area for a wire bond on the die paddle, whose dimensions equal that single bond pad on the die.

5.0 EVALUATION RESULT DATA and SAM IMAGES:

5.1 CSAM Image Prior and After MSL test



5.2 Reflow Profile, CSAM Image & A-scan Image



6.0 OBSERVATION/ SUMMARY:

1. MSL 1 Test Result:

    1. External visual inspection of the package body of sample units was noted with no anomaly.(All units inspected).
    2. CSAM inspection of 22 sample units prior MSL1 was noted with no delamination on the interfaces such as top of die to mold, paddle to mold and leads/post to mold interfaces.
    3. CSAM inspection of 22 sample units post MSL1 was noted with no delamination on the interfaces such as top of die to mold, paddle to mold and leads/post to mold interfaces.

7.0 CONCLUSION:

Based on the post MSL1 CSAM delamination check, the **18L SWOB** package on **BS2O*B6LA83R** device assembled at Cirtek Electronics Corporation could meet the stress test requirements and passed the epoxy evaluation, accepted and recommended by JEDEC and also satisfy MSL1 classification for lead free process.