Reliability Evaluation Report

MDG-MCD-RER1913

ASE Kaohsiung (Taiwan)

LQFP7x7 32L & 48L and LQFP10x10 64L

Bonding Wire procurement flexibility on listed products

(PCN12094)

General Information	
Commercial Product	*STM32F303K8T6* *STM32F205RET6* *STM8L052C6T6*
Product Line	*438X66* *411X66* *764X19*
Product Description	*STM32(5V*438)* *STM32(5W*411)* *STM8L(5B*764)*
Package	*LQ7x7 32L* *LQ7x7 48L* *LQ10x10 64L*
Silicon Technology	*0.18 TSMC* *M10 TSMC* *F9GO2 RSST* *F9GO2 SG8E*
Division	*: MDG-MCD*

Traceability	
Diffusion Plant	*TSMC Fab3* *TSMC Fab14* *RS8F Rousset* *Singapore SG8E 8"*
Assembly Plant	*: ASEKH – TAIWAN*

Reliability Assessment	
Pass	☒
Fail	☐

Note: *this report is a summary of the reliability trials performed in good faith by STMicroelectronics in order to evaluate the electronic device conformance to its specific mission profile. This report and its contents shall not be disclosed to a third party without previous written agreement from STMicroelectronics or under the approval of the author (see below).*

Version	Date	Author	Function
1.0	24th September 2021	Berengere Routier-Scappucci	MDG-MCD-QA Back end

APPROVED BY:

Function	Location	Name	Date
Division Q&R Responsible	RSST	Pascal NARCHE	27th September 2021
Division Quality Manager	RSST	Gisele SEUBE	27th September 2021

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1 RELIABILITY EVALUATION OVERVIEW

1.1 Objective

The aim of this report is to present results of the reliability evaluation for LQFP 7x7 and LQFP 10x10 packages assembled with silver wires and tested at ASEKH Kaohsiung (Taiwan) for STM8L and STM32.

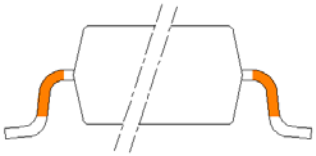
Production Change Notification PCN12094 concerns same line LQFP 7x7 & 10x10 packages for products in silicon technology F9GO2 Rousset & SG8E.

Changes are described in table below:

	Existing back-end line				Added back-end line
Assembly site	Amkor ATP (Philippines)	ST Muar (Malaysia)	StatsChipPAC Jiangyin JSCC (China)	ASE Kaohsiung (Taiwan)	
Leadframe	Copper Frame Ring Ag	Copper Frame Ring Ag & Pre Plated Frame	Copper Frame Ring Ag		
Leadfinishing (1)	Pure Tin (e3)	Pure Tin (e3) & Ni Pd Au (e4)	Pure Tin (e3)		
Resin (2)	Sumitomo G631HQ	Sumitomo G700LS	Sumitomo G631SHQ	Sumitomo G631SH	
Glue	Evertech AP4200	Hitachi EN4900	Ablestik 3230	Sumitomo CRM 1076WA	
Wire	Gold 0.8mil	Gold 0.8mil & Silver 96.5% 0.8mil	Gold 0.8mil & Silver 96.5% 0.8mil	Gold 0.8mil	Silver 96.5% 0.8mil

(1) Lead color and surface finish change depending on leadfinishing.

(2) Package darkness changes depending on molding compound.



Pin1 identifier can change in terms of form and positioning.
Marking position and size could be different upon assembly site, without any loss of information.

1.2 Reliability Strategy

LQFP 7x7 & 10x10 packages is already qualified in Gold wires at ASE Kaohsiung.

Test vehicles are described here below:

Product	Package	Process	Assembly plant	Trials
STM32F303K8T6	LQ7x7 32L	0.18 TSMC	ASEKH – TAIWAN	1 assembly lot
STM32F205RET6	LQ10x10 64L	M10 TSMC		1 assembly lot
STM8L052C6T6	LQ7x7 48L	F9GO2 RSST		1 assembly lot
STM8L052C6T6	LQ7x7 48L	F9GO2 SG8E		1 assembly lot

Qualification is based on standard STMicroelectronics Corporate Procedures for Quality and Reliability, in full compliancy with the JESD-47 international standard

1.3 Conclusion

All reliability tests have been completed with positive results. Neither functional nor parametric rejects were detected at final electrical testing.

According to good reliability tests results in line with reliability strategy, the qualification is granted for packages LQFP 7x7 & 10x10 with silver wires assembled at ASEKH TAIWAN.

Refer to Section 3.0 for reliability test results.

2 TEST VEHICLE CHARACTERISTICS

2.1 Generalities

Package line	Assembly Line Package	Device (RawLine Code)	Diffusion Process	Number of Lots
LQFP	LQFP 32 7x7x1.4	I25V*438ZZXZ	0.18EMBF/2P	1
	LQFP 64 10x10x1.4	I45W*411ISX3	CMOSM10ULP	1
	LQFP 48 7x7x1.4	I75B*764ISXY	CMOSF9-GO2	1
	LQFP 48 7x7x1.4	I75B*764ISX9	CMOSF9-GO2	1

2.2 Traceability

2.2.1 Wafer fab information

Table 1

Wafer fab information	
FAB1	**438**
Wafer fab name / location	TSMC Fab3
Wafer diameter	8 inch
Wafer thickness	381± 25µm
Silicon process technology	0.18 Gen.Emb.Flash logic TSMC
Number of masks	33
Die finishing front side (passivation) materials/thicknesses	HDPox 10kA+SRO 1.5kA+PESIN 6kA/1.75µm
Die finishing back side Materials/thicknesses	RAW SILICON – BACK GRINDING
Die area (Stepping die size)	X:3914µm Y:3760µm 14.72mm²
Die pad size (X,Y)	65µmx70µm
Sawing street width (X,Y)	80µmx80µm
Metal levels/Materials/Thicknesses (µm)	Tin/AlCu/Tin 0.450 Tin/AlCu/Tin 0.450 Tin/AlCu/Tin 0.450 Tin/AlCu/Tin 0.450 Tin/AlCu/Tin 0.875

Table 2

Wafer fab information	
FAB2	**411**
Wafer fab name / location	TSMC Fab14
Wafer diameter	12 inch
Wafer thickness	775 ± 25µm
Silicon process technology	CMOSM10ULP
Number of masks	42
Die finishing front side (passivation) materials/thicknesses	USG + NITRIDE/1.9µm
Die finishing back side Materials/thicknesses	RAW SILICON
Die area (Stepping die size)	X:4006µm Y:3674µm 14.72mm²
Die pad size (X,Y)	59µmx123µm
Sawing street width (X,Y)	80µmx80µm
Metal levels/Materials/Thicknesses (µm)	TaN/Ta/CuSeed/Cu 0.220 TaN/Ta/CuSeed/Cu 0.280 TaN/Ta/CuSeed/Cu 0.280 TaN/Ta/CuSeed/Cu 0.280 TaN/Ta/CuSeed/Cu 0.280 Ta/TaN/AlCu 0.730 AlCu 1.200

Table 3

Wafer fab information	
FAB3	**764**
Wafer fab name / location	F9GO2 Rousset
Wafer diameter	8 inch
Wafer thickness	375 ± 25µm
Silicon process technology	CMOSF9
Number of masks	39
Die finishing front side (passivation) materials/thicknesses	USG + NitUV (HFP USG+UV Nitride)/1.75µm
Die finishing back side Materials/thicknesses	RAW SILICON – BACK GRINDING
Die area (Stepping die size)	X:1738µm Y:2876µm 4.998mm²
Die pad size (X,Y)	65µmx108µm
Sawing street width (X,Y)	80µmx80µm
Metal levels/Materials/Thicknesses (µm)	TaN/Ta/Cu 0.280 TaN/Ta/Cu 0.350 TaN/Ta/Cu 0.350 TaN/Ta/Cu 0.350 Ti/AlCu/TxTN 0.900

Table 4

Wafer fab information	
FAB3	**764**
Wafer fab name / location	F9GO2 Singapore SG8E
Wafer diameter	8 inch
Wafer thickness	375 ± 25µm
Silicon process technology	CMOSF9
Number of masks	39
Die finishing front side (passivation) materials/thicknesses	USG + NitUV (HFP USG+UV Nitride)/1.75µm
Die finishing back side Materials/thicknesses	RAW SILICON – BACK GRINDING
Die area (Stepping die size)	X:1738µm Y:2876µm 4.998mm²
Die pad size (X,Y)	65µmx108µm
Sawing street width (X,Y)	80µmx80µm
Metal levels/Materials/Thicknesses (µm)	TaN/Ta/Cu 0.280 TaN/Ta/Cu 0.350 TaN/Ta/Cu 0.350 TaN/Ta/Cu 0.350 Ti/AlCu/TxTN 0.900

2.2.2 Assembly information

Table 5

Assembly Information – Die 438	
Package 1-LQFP 32 7x7x1.4	
Assembly plant name / location	ASEKH– Taiwan
Pitch	1.0mm
Die thickness after back-grinding	375 ± 25µm
Die sawing method	Step cut
Bill of Material elements	
Lead frame/reference	LF# A24958 DR Pure tin C7025 4.307sq slots
Lead frame finishing (material/thickness)	Pure tin thickness: tolerance 7 to 20µm
Die attach material/type(glue/film)/supplier	GLUE SUMITOMO EPOXY CRM 1076WA
Wire bonding material/diameter	Wire Ag 96.5 0.8mil diam
Molding compound material/supplier	MOLDING RESIN SUMITOMO EME-G631SH
Package Moisture Sensitivity Level (JEDEC J-STD020D)	3

Table 6

Package 2-LQFP 64 10x10x1.4 – Die 411	
Assembly plant name / location	ASEKH- Taiwan
Pitch	1.0mm
Die thickness after back-grinding	375 ± 25µm
Die sawing method	Laser Groove + mechanical sawing
Bill of Material elements	
Lead frame/reference	LF# A25060 LQ64 Pure Tin C7025 5.7sq
Lead frame finishing (material/thickness)	Pure tin thickness: tolerance 7 to 20µm
Die attach material/type(glue/film)/supplier	GLUE SUMITOMO EPOXY CRM 1076WA
Wire bonding material/diameter	Wire Ag 96.5 0.8mil diam
Molding compound material/supplier	MOLDING RESIN SUMITOMO EME-G631SH
Package Moisture Sensitivity Level (JEDEC J-STD020D)	3

Table 7

Package 3-LQFP 48 7x7x1.4 – Die 764	
Assembly plant name / location	ASEKH- Taiwan
Pitch	1.0mm
Die thickness after back-grinding	375 ± 25µm
Die sawing method	Step cut
Bill of Material elements	
Lead frame/reference	LF# A24950 LQ48L Pur tin C7025 4.092sq
Lead frame finishing (material/thickness)	Pure tin thickness: tolerance 7 to 20µm
Die attach material/type(glue/film)/supplier	GLUE SUMITOMO EPOXY CRM 1076WA
Wire bonding material/diameter	Wire Ag 96.5 0.8mil diam
Molding compound material/supplier	MOLDING RESIN SUMITOMO EME-G631SH
Package Moisture Sensitivity Level (JEDEC J-STD020D)	3

2.2.3 Reliability testing information

Table 8

Reliability Testing Information	
Reliability laboratory name / location	Rousset/France

Note: ST is ISO 9001 certified. This induces certification of all internal and subcontractor labs.
ST certification document can be downloaded under the following link:
http://www.st.com/content/st_com/en/support/quality-and-reliability/certifications.html

3 TESTS RESULTS SUMMARY

3.1 Lot Information

Table 9

Lot #	Diffusion Lot / Wafer ID	Die Revision (Cut)	Assy Lot / Trace Code	Raw Line	Package	Note
1	93929045	Cut 1.1	AA943155	I25V*438ZZXZ	LQFP 32 7x7x1.4	Package Reliability assessment
2	9R807141	Cut 2.5	AA942042	I45W*411ISX3	LQFP 64 10x10x1.4	
3	VG808155	Cut 2.1	AA939125	I75B*764ISXY	LQFP 48 7x7x1.4	
4	VC907X41	Cut 2.1	AA952169	I75B*764ISX9	LQFP 48 7x7x1.4	

3.2 Test plan and results summary

Table 10 – ACCELERATED ENVIRONMENT STRESS TESTS

Test code	Stress method	Stress Conditions	Lots	S.S.	Total	Results/Lot Fail/S.S.	Comments: (N/A =Not Applicable)
ESD CDM	ANSI/ESDA/ JEDEC JS-002	250V	4	3	12	Lot1: 0/3 Lot2: 0/3 Lot3: 0/3 Lot4: 0/3	
PC	J-STD-020	24h bake@125°C, MSL3 (192h@30C/60%RH) 3x Reflow simulation Peak Reflow Temp= 260°C	4	308	1232	Lot1: 0/308 Lot2: 0/308 Lot3: 0/308 Lot4: 0/308	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc ☒ After PC	4	77	308	Lot1: 0/77 Lot2: 0/77 Lot3: 0/77 Lot4: 0/77	
UHAST	JESD22-A118	Ta=130°C ,85% RH Duration= 96hrs ☒ After PC	4	77	308	Lot1: 0/77 Lot2: 0/77 Lot3: 0/77 Lot4: 0/77	
HTSL	JESD 22-A103	Ta=150°C , Duration= 1000hrs ☒ After PC	4	77	308	Lot1: 0/77 Lot2: 0/77 Lot3: 0/77 Lot4: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 Duration= 1000hrs ☒ After PC	4	77	308	Lot1: 0/77 Lot2: 0/77 Lot3: 0/77 Lot4: 0/77	

Note: Test method revision reference is the one active at the date of reliability trial execution

Table 11 - PACKAGE ASSEMBLY INTEGRITY TESTS

Test code	Method	Test Conditions	Lots	S.S.	Total	Results/Lot Fail/S.S.	Comments: (N/A =Not Applicable)
CA	Construction Analysis including -Wire bond shear -Wire bond pull	ST Internal specifications	4	40	160	Lot1: 0/40 Lot2: 0/40 Lot3: 0/40 Lot4: 0/40	N° CA-59-1219 (438) N° CA-58-1219 (411) N° CA-52-1119 (764 - ROUSSET diff plant) N° CA-13-0320 (764 - SG8E diff plant)

4 APPLICABLE AND REFERENCE DOCUMENTS

Reference	Short description
ANSI/ESDA JEDEC JS-002	Electrostatic discharge (ESD) sensitivity testing charge device model (CDM)
J-STD-020:	Moisture/reflow sensitivity classification for non-hermetic solid state surface mount devices
JESD22-A113:	Preconditioning of non-hermetic surface mount devices prior to reliability testing
JESD22-A118:	Unbiased Highly Accelerated temperature & humidity Stress Test
JESD22-A110:	Temperature Humidity Bake
JESD22-A104:	Temperature cycling

5 GLOSSARY

Reference	Short description
PC	Preconditioning (solder simulation)
THB	Temperature Humidity Bias
TC	Temperature cycling
uHAST	Unbiased Highly Accelerated Stress Test
HTSL	High temperature storage life
DMS	ST Advanced Documentation Controlled system/ Documentation Management system
ESD CDM	Electrostatic discharge (charge device model)
CA	Construction Analysis

6 REVISION HISTORY

Revision	Author	Content description	Approval List			
			Function	Location	Name	Date
1.0	B Routier-Scappucci	Initial release	Division Q&R Responsible	ST Rousset	Gisèle SEUBE	27th September 2021
			Division Quality Manager	ST Rousset	Pascal NARCHE	27th September 2021

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PRODUCT/PROCESS CHANGE NOTIFICATION
PCN12094– Additional information

ASE Kaohsiung (Taiwan)
LQFP7x7 32L & 48L and LQFP10x10 64L
Bonding Wire procurement flexibility
On listed products

MDG - Microcontrollers Division (MCD)

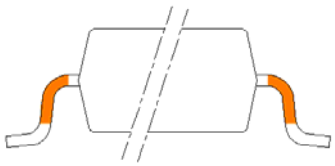
What are the changes?

Changes described in table below:

				Existing back-end line	Added back-end line
Assembly site	Amkor ATP (Philippines)	ST Muar (Malaysia)	StatsChipPAC Jiangyin JSCC (China)	ASE Kaohsiung (Taiwan)	
Leadframe	Copper Frame Ring Ag	Copper Frame Ring Ag & Pre Plated Frame	Copper Frame Ring Ag		
Leadfinishing (1)	Pure Tin (e3)	Pure Tin (e3) & Ni Pd Au (e4)	Pure Tin (e3)		
Resin (2)	Sumitomo G631HQ	Sumitomo G700LS	Sumitomo G631SHQ	Sumitomo G631SH	
Glue	Evertech AP4200	Hitachi EN4900	Ablestik 3230	Sumitomo CRM 1076WA	
Wire	Gold 0.8mil	Gold 0.8mil & Silver 96.5% 0.8mil	Gold 0.8mil & Silver 96.5% 0.8mil	Gold 0.8mil	Silver 96.5% 0.8mil

(1) Lead color and surface finish change depending on leadfinishing.

(2) Package darkness changes depending on molding compound.

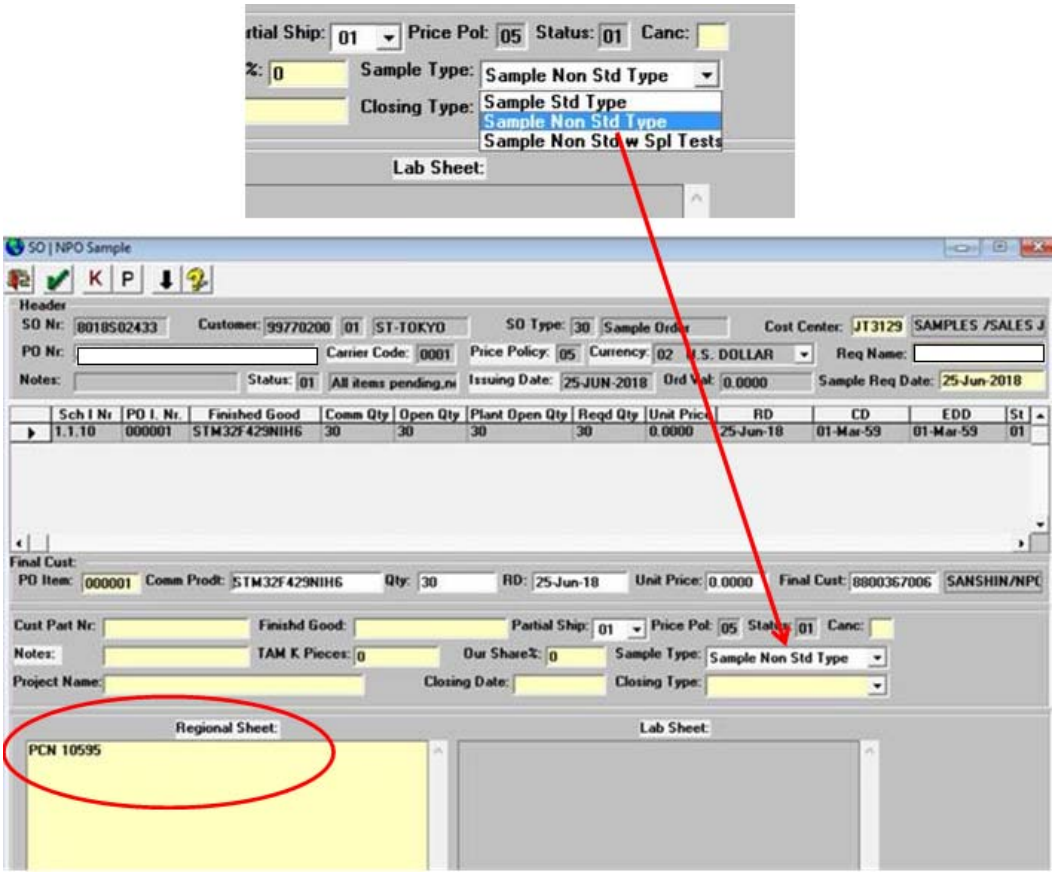


Pin1 identifier can change in terms of form and positioning.
Marking position and size could be different upon assembly site, without any loss of information.

How to order samples?

For all samples request linked to this PCN, please:

- place a **Non-standard** sample order (choose Sample Non Std Type from pull down menu)
- insert the PCN number "**PCN12094**" into the NPO Electronic Sheet/**Regional Sheet**
- request sample(s) through Notice tool, indicating a single Commercial Product for each request



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