PRODUCT/PROCESS CHANGE NOTIFICATION
PCN 10994 – Additional information

ST Muar (Malaysia) back-End line capacity extension
STM32 LQFP 14x14 listed products

MDG - Microcontrollers Division (MCD)

What are the changes?

Changes are described in the below table on LQFP 14x14 packages:

	Existing back-end lines			Added back-end line
Assembly site	ST Muar Malaysia	ASE Kaohsiung Taiwan	Amkor ATP Philippines	ST Muar Malaysia
Leadframe finishing	PPF	Pure Tin	PPF	Pure Tin
Mold Compound/Resin (1)	Sumitomo EME-G700L	Sumitomo EME-G631SH	Sumitomo EME-G631HQ	Sumitomo EME-G700LS
Glue	Henkel 3280T	Sumitomo CRM 1076WA	Sumitomo CRM 1076YB	Henkel 8302
Wire	Gold 1.0mil	Gold 0.8mil	Gold 0.8mil	Silver 96.5% 0.8mil
Enhanced Traceability in marking	No digit	2 digits	No digit	2 digits

(1) 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.

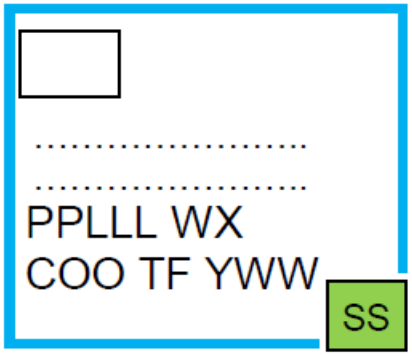
How can the change be seen?

PP code indicates the Assembly traceability plant code.

Existing		Additional	
PP code	back-end lines	**PP** code	back-end line
99	ST Muar Malaysia	99	ST Muar Malaysia
7B	Amkor ATP Philippines		
AA	ASE Kaohsiung Taiwan		

In case parts **PP** code is 99 then check Enhanced traceability in marking (**SS** marking) Products from existing ST Muar Malaysia assembly line doesn't have SS marking while products from extended capacity line will have SS marking.

SS marking is inserted at the bottom right corner and indicates the sublot assembly traceability information.

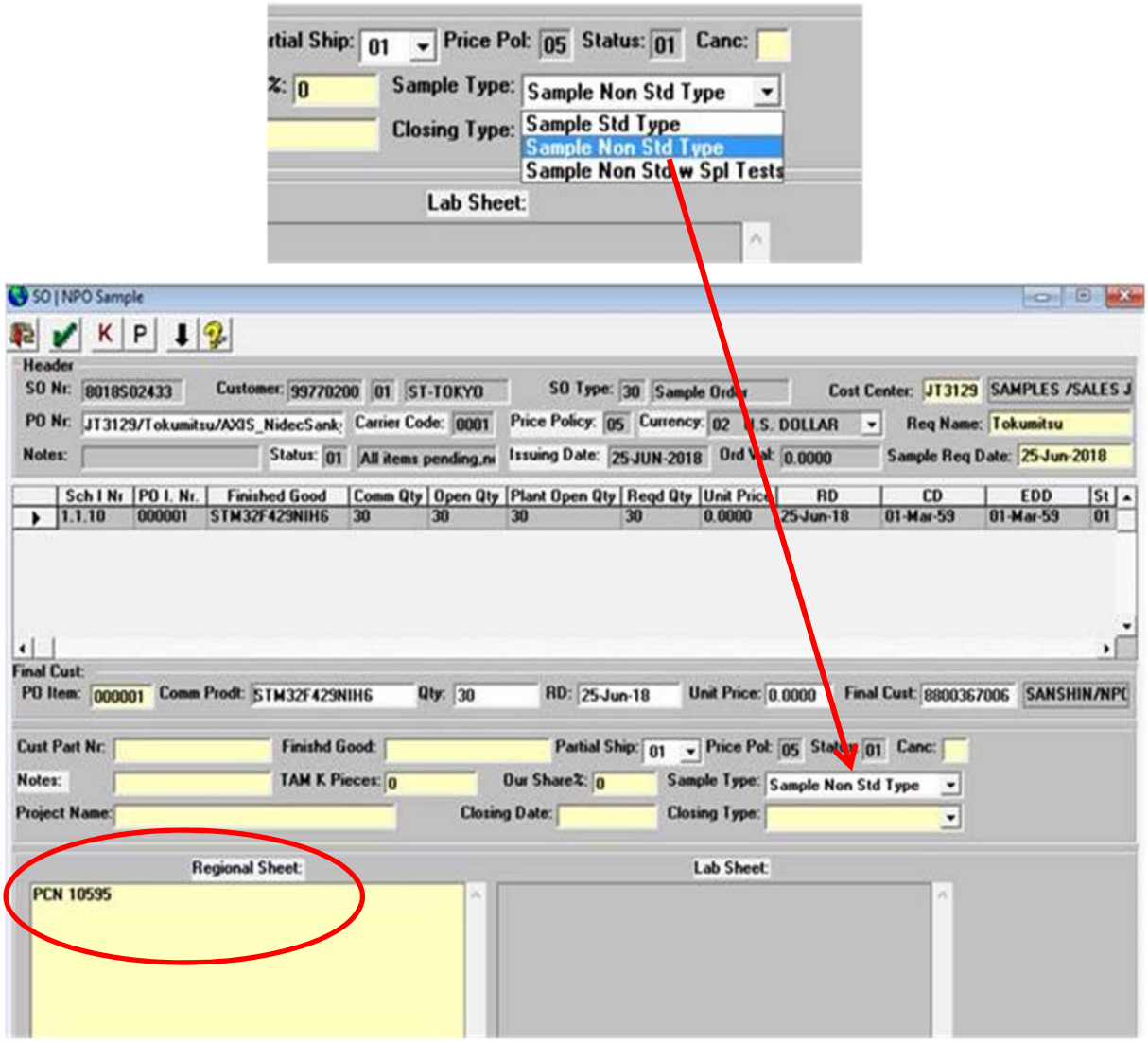


Please refer to the DataSheet for marking details.

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 "**PCN 10994**" into the NPO Electronic Sheet/**Regional Sheet**
- request sample(s) through Notice tool, indicating a single Commercial Product for each request



MDG - MCD RER1604
Reliability Report

Qualification Type: ASSEMBLY LINE QUALIFICATION, NEW BILL OF MATERIALS

LQFP 14x14 100L – ST Muar
Additional back-end line qualification
Test Vehicles 410, 427, 414, 415, 411, 419, 413

(PCN MMS-MCD/15/9511 dated 5 Nov 2015)
(PCN10994 dated Sept 2019)

Product / Process & Package Information	Die 410	Die 427	Die 414	Die 415	Die 411	Die 419	Die 413
Commercial Product:	STM32F103 VBT6	STM32L152 VCT6	STM32F103 VET6	STM32L476 VGT6	STM32F205 VGT6	STM32F427 VIT6	STM32F415VG T6
Product Line:	STM32F die 410	STM32L die 427	STM32F die 414	STM32L Die 415	STM32F Die 411	STM32F Die 419	STM32F Die 413
Product Description:	Micro 32Bits						
Finish Good Code:	IS32F103 VBT6$98	IS32L152 VCT6$U6	IS32F103 VET6$UA	IS32L476V GT6$94	IS32F205V GT6$98	IS32F427VI T6$U6	IS32F415VGT6 $97
Mask Set Revision:	X410XXXX	X427XXXV	X414XXX3	R415XXX4	R411XXX2	R419XXX3	R413XXX4
Silicon Process Technology:	0.18 M8 EMBEDDED FLASH	8X - CMOSF9S	0.18 M8 EMBEDDE D FLASH	N90_eFLAS H_6M1T	CMOSM10 6M1T	CMOSM10 6M1T	CMOSM10 6M1T
Wafer Fabrication Location:	TSMC Fab 3 Taiwan	ST Rousset 8 France	TSMC Fab 8 Taiwan	TSMC Fab14	ST Crolles	ST Crolles	TSMC Fab14
Electrical Wafer Sort Test Plant Location:	ST MICROELECTRONICS Ang Mo Kio EWS SINGAPORE		ARDENTEC Hsinchu EWS Taiwan	ST MICROELECTRONICS Ang Mo Kio EWS SINGAPORE		ARDENTEC Hsinchu EWS Taiwan	ARDENTEC Hsinchu EWS Taiwan
Package:	LQFP 100 14x14x1.4						
Assembly Plant location:	ST Muar (Malaysia)						
Final Test plant location:	ST Muar (Malaysia)						

Approval List			
Function	**Location**	**Name**	**Date**
Division BE Quality Manager	ST Rousset	Gisele SEUBE	October 15, 2019
Division Quality Manager	ST Rousset	Pascal NARCHE	October 15, 2019

Contents

1 RELIABILITY RESULTS OVERVIEW

1.1 Objectives

This report summarizes the reliability results for LQFP 100 14x14 package manufactured at ST Muar (Malaysia).

Test vehicles are described here below:

Product	Package
STM32L152VCT6	LQFP 100 14x14x1.4
STM32F103VET6	
STM32F103VBT6	
STM32L476VGT6	
STM32F205VGT6	
STM32F427VIT6	
STM32F415VGT6	

1.2 Context

Due to the success on the market of STM32 devices, ST Microcontrollers Division decided to qualify an additional line to maintain state of the art service level to our customers, improving flexibility on manufacturing sites, thanks to extra capacity.

Changes are described in the below table on LQFP 14x14 packages:

Existing manufacturing sites				Added manufacturing site
Assembly site	Amkor ATK (Korea)	Amkor ATP (Philippines)	ST Muar (Malaysia)	ST Muar (Malaysia)
Mold compound	Nitto GE7470LQ	Sumitomo G631HQ	Sumitomo EME-G700L	Sumitomo EME-G700LS
Glue	Ablestik 8200C	Sumitomo CRM1076YB	Henkel 3280T	Henkel ABP8302
Leadframe finishing (*)	PPF	PPF	PPF	Pure Tin
Silver wire	0.8mil Au	0.8mil Au	1.0mil Au	0.8mil Ag

(*) Lead color and surface finish change depending on lead finishing

Changes are qualified using the 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 for 410,414,427 (Products phase 1) for assembly line qualification then 415,411,419, 413 (Products phase 2/3) for proliferation of different Front End technology. Neither functional nor parametric rejects were detected at final electrical testing.

According to the positive reliability results, the qualification is granted for LQFP14x14 package assembled at ST Muar (Malaysia).

2 RELIABILITY TEST VEHICLES Characteristics

2.1 Reliability Test vehicles description

Package line	Assembly Line Package	Products Phase	Device (Partial Raw Line Code)	Diffusion Process	Number of Lots
SHD LQFP	LQFP14*14 100L	1	STM32 (1L*410) STM32 (1L*414) STM32L (1L*427)	TSMC 0.18µm TSMC 0.18µm F9GO2S (ST Rousset)	1 1 1
		2	STM32 (1L*411) STM32 (1L*419) STM32 (1L*415)	M10 (ST Crolles) M10 (ST Crolles) TSMC 90nm	1 1 1
		3	STM32 (1L*413)	TSMC M10	1

2.2 Reliability Information

Lot ID	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7
Die Name /cut:	410	427	414	415	411	419	413
Diffusion Lot Number:	93610010	VG540403	98612075	9R606046	VQ647800	VQ607810	9R808115
Trace Code:	996220MM	996241E1	996220MN	99723041	997210YD	9973110J	99831124
Assy lot number	996220MM 01	996241E1 01	996220MN RR	99723041 RR	997210YD RR	9973110J 02	99831124 01
Raw Line Code Package:	921L*410 ESXX	U01L*427 ISXV	UH1L*414 ISX3	931L*415 ISX4	931L*411 ISX2	U01L*419 ISX3	941L*413 EIX4
Reliability Lab location :	ST Muar (Malaysia) *(except THB for 415 done in Grenoble)*						

2.3 Front-End information

Front-End	Lot 1 (410)	Lot 2 (427)	Lot 3 (414)	Lot 4 (415)	Lot 5 (411)	Lot 6 (419)	Lot 7 (413)
Wafer Diameter:	8 inches			12 inches			
Wafer Thickness:	375 +/-25 µm			775 +/-25 µm			
Die Size:	3.3908 x 3.328 µm	3.263 x 4.199 mm	4.511 x 4.440 mm	3.794 x 4.443 mm	4.006 x 3.674 mm	5.582 x 4.556 mm	4.004 x 4. 258 mm
Scribe Line size x/y:	80 x 80 µm		80.6 x 80.2 µm	80 x 80 µm			
Pad Die Size /Pad type:	59 x 123 µm	53 x 108 µm	65 x 70 µm	123 x 59 µm	123 x 59 µm 63 x 73 µm	123 x 59µm	123 x 59 µm 63 x 73 µm
Metal Layers Number /Materials /Thickness:	Metal 1 Tin/AlCu/Tin 0.450 µm Metal 2 Tin/AlCu/Tin 0.450 µm Metal 3 Tin/AlCu/Tin 0.450 µm Metal 4 Tin/AlCu/Tin 0.450 µm Metal 5 Tin/AlCu/Tin 0.875 µm	Metal 1 TaN/Ta/Cu 0.280 µm Metal 2 Ti/AlCu/TxTN 0.310 µm Metal 3 Ti/AlCu/TxTN 0.310 µm Metal 4 Ti/AlCu/TxTN 0.310 µm Metal 5 Ti/AlCu/TxTN 1.200 µm	Metal 1 Tin/AlCu/Tin 0.450 µm Metal 2 Tin/AlCu/Tin 0.450 µm Metal 3 Tin/AlCu/Tin 0.450 µm Metal 4 Tin/AlCu/Tin 0.450 µm Metal 5 Tin/AlCu/Tin 0.875 µm	Metal 1 TaN/Ta/Cu Seed /Cu 0.240 µm Metal 2 TaN/Ta/Cu Seed /Cu 0.310 µm Metal 3 TaN/Ta/Cu Seed /Cu 0.310 µm Metal 4 TaN/Ta/Cu Seed /Cu 0.310 µm Metal 5 TaN/Ta/Cu Seed /Cu 0.310 µm Metal 6 TaN/Ta/Cu Seed /Cu 0.850 µm Metal 7 AlCu 1.450µm	Metal 1 TaN/CuSeed/ Cu 0.240 µm Metal 2 TaN/CuSeed/ Cu 0.330 µm Metal 3 TaN/CuSeed/ Cu 0.330 µm Metal 4 TaN/CuSeed/ Cu 0.330 µm Metal 5 TaN/CuSeed/ Cu 0.330 µm Metal 6 TaN/CuSeed/ Cu 0.850 µm Metal 7 AlCu/TinArc 1.450µm	Metal 1 TaN/CuSeed/ Cu 0.240 µm Metal 2 TaN/CuSeed/ Cu 0.330 µm Metal 3 TaN/CuSeed/ Cu 0.330 µm Metal 4 TaN/CuSeed/ Cu 0.330 µm Metal 5 TaN/CuSeed/ Cu 0.330 µm Metal 6 TaN/CuSeed/ Cu 0.850 µm Metal 7 AlCu/TinArc 1.450µm	Metal 1 TaN/Ta/Cu Seed /Cu 0.220 µm Metal 2 TaN/Ta/Cu Seed /Cu 0.280 µm Metal 3 TaN/Ta/Cu Seed /Cu 0.280 µm Metal 4 TaN/Ta/Cu Seed /Cu 0.280 µm Metal 5 TaN/Ta/Cu Seed /Cu 0.280 µm Metal 6 Ta/TaN/AlCu 0.730 µm Metal 7 AlCu 1.200 µm
Passivation Layers :	HDPox 10kA+SRO 1.5kA+ PESIN 6kA	USG + NitUV (HFP USG+UV Nitride)	HDPox 10kA+SRO 1.5kA+ PESIN 6kA	PSG + NITRIDE	PSG + NITRIDE	PSG + NITRIDE	USG + NITRIDE
Back Metal Finishing	RAW SILICON - BACK GRINDING			RAW SILICON			

2.4 Back-End information

Back-End	Lot 1 (410)	Lot 2 (427)	Lot 3 (414)	Lot 4 (415)	Lot 5 (411)	Lot 6 (419)	Lot 7 (413)
Assembly Plant Location/ Address:	ST MICROELECTRONICS TANJONG AGAS IND ESTATE PO BOX 28 84007 MUAR / JOHOR MALAYSIA						
Die Thickness after Back grinding:	NA	NA	NA	375 +/-25 µm			
Die sawing method:	Step cut						
Die attach material: **Type:** **Supplier:**	Glue ABP8302 Loctite Ablestik (Henkel)						
Lead frame material: **L/F Finishing Type:** **Die paddle size:** **Supplier:**	RgAg+TNCu3r LF-HD LQFP 100L 14x14 TNCu3 Ring Ag 5.2 x 5.2 Shinko					RgAg+TNCu3r LF-HD LQFP 100L 14x14 TNCu3 Ring Ag 6.6 x 6.6 Shinko	RgAg+TNCu3r LF-HD LQFP 100L 14x14 TNCu3 Ring Ag 5.2 x 5.2 Shinko
Wire bonding: **Type /Diameter:** **Supplier:**	AG 96,5% WIRE 0.8MIL MKE						
Pitch:	80µm	70µm	80µm	65µm			
POA:	0086901						
Molding Compound Supplier:	EME-G700LS SUMITOMO						
Package Moisture Sensitivity Level (JEDEC J-STD020D):	3						

3 RELIABILITY RESULTS SUMMARY

3.1 Die oriented test

	Die Related Tests					Results LQFP 14x14						
Description	**Test/Method**	**Conditions**	**Sample Size**	**Criteria**	**Readout / Duration**	**410**	**427**	**414**	**415**	**411**	**419**	**413**
Electrostatic discharge – Charge Device Model												
ESD CDM	ANSI/ESD STM5.3.1	500V	3 units	500V	NA	0/3	0/3	0/3	NA	NA	NA	NA
ESD CDM	ANSI/ESD STM5.3.1	250V	3 units	250V	NA	NA	NA	NA	0/3	NA	0/3	NA
ESD CDM	JESD22-C101D	500V	3 units	500V	NA	NA	NA	NA	NA	0/3	NA	0/3

3.2 Package Oriented Test

	Package Related Tests					Results LQFP 14x14		
Description	**Test/Method**	**Conditions**	**Sample Size**	**Criteria**	**Readout / Duration**	**410**	**427**	**414**
PC	J-STD-020 JESD22-A113	MSL3	231 units	Electrical test: A0/R1 (Accepted 0 reject/ Rejected 1 reject)	NA	0/231	0/231	0/231
		Delamination	60 units	No delamination		0/60	0/60	0/60
HTSL (no preconditioning)	JESD 22-A103	150°C	77 units	Elect test A0/R1	1000h	0/77	0/77	0/77
TC	JESD 22-A104	-50c/+150°c	77 units	Elect test A0/R1	1000cy	0/77	0/77	0/77
					2000cy as monitoring	0/77	0/77	0/77
Wire Bond Shear	AEC Q100-001	Min bond shear 15g after TC	30wires x 3	A0/R1	After TC 500cy TC 1000cy	0/30	0/30	0/30
Wire Bond Pull	Mil Std 883 Method 2011	Minimum pull strength after TC=3 grams after TC	30wires x 3	A0/R1	After TC 500cy TC 1000cy	0/30	0/30	0/30
UHAST	JESD 22A118	130°C ,85% 2Atm RH	77 units	Elect test A0/R1	96h	0/77	0/77	0/77
THB	JESD 22A110	85°C/85%RH Bias	77 units	Elect test A0/R1	1000h	0/77	0/77	0/77

Construction Analysis						
CA	Construction Analysis including : -Wire bond shear -Wire bond pull -Solderability -Physical Dimension	JESD 22B102 JESDB100/B108	50		No major concern	No major concern

	Package Related Tests					Results LQFP 14x14			
Description	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Readout / Duration***	***415***	***411***	***419***	***413***
PC	J-STD-020 JESD22-A113	MSL3	231 units	Electrical test: A0/R1 (Accepted 0 reject/ Rejected 1 reject)	NA	0/231	0/231	0/231	0/231
		Delamination	60 units	No delamination		0/60	0/60	0/60	0/60
HTSL (no preconditioning)	JESD 22-A103	150°C	77 units	Elect test A0/R1	1000h	0/77	0/77	0/77	0/77
TC	JESD 22-A104	-50c/+150°c	77 units	Elect test A0/R1	1000cy	0/77	0/77	0/77	0/77
PPT	JESD 22-A102	121°C ,100% 2Atm RH	77 units	Elect test A0/R1	96h	0/77	0/77	0/77	0/77
THB	JESD 22A110	85°C/85%RH Bias	77 units	Elect test A0/R1	1000h	0/77	0/77	0/77	0/77
Construction Analysis									
CA		JESD 22B102 JESDB100/B108	50	No major concern		No major concern			

4 APPLICABLE AND REFERENCE DOCUMENTS

ADCS/DMS 0061692 :	Reliability Tests And Criteria For Qualifications
SOP 2.6.2:	Process qualification and transfer management
SOP 2.6.7:	Product Maturity Level
SOP 2.6.9:	Package and process maturity management in Back End
SOP 2.6.11:	Program management from product qualification
SOP 2.6.19:	Process maturity level
ANSI-ESD STM5.3.1:	Electrostatic discharge (ESD) sensitivity testing charge device model (CDM)
JESD 22-A103	High Temperature Storage Life
J-STD-020D:	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-A104:	Temperature cycling
JESD22-A110:	Temperature Humidity Bake
JESD22-A102:	Pressure Pot (Unbiased Autoclave Test)
JESD 22B102:	Solderability test
JESD22B100/B108:	Physical dimension

5 GLOSSARY AND TESTS DESCIPTION

PC	Preconditioning (solder simulation)
THB	Temperature Humidity Bias
TC	Temperature cycling
uHAST	Unbiased HAST
PPT	Pressure Pot (Unbiased Autoclave Test)
HTSL	High temperature storage life
ADCS/DMS	ST Advanced Documentation Controlled system/ Documentation Management system
ESD CDM	Electrostatic discharge (charge device model)
CA	Construction Analysis

6 REVISION HISTORY

Version	Date	Author	Comment
1.0	October 17, 2016	Lionel NEVORET	Initial release for qualification
1.1	January 24, 2017	Gisele Seube	Sample size correction page 7
2.0	August 03, 2018	Lionel NEVORET	Update with 415, 411 & 419 result
3.0	October 15, 2019	Lionel NEVORET	Update with 413 result

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