

## PRODUCT / PROCESS CHANGE INFORMATION

### 1. PCI basic data

1.1 Company	 STMicroelectronics International N.V
1.2 PCI No.	MDG/23/14159
1.3 Title of PCI	ST MUAR (Malaysia) LQFP14x14 package leadframe enhancement for STM32F4xx listed products
1.4 Product Category	STM32F413VGTx STM32F413VHT6 STM32F423VHT6
1.5 Issue date	2023-07-04

### 2. PCI Team

2.1 Contact supplier	
2.1.1 Name	ROBERTSON HEATHER
2.1.2 Phone	+1 8475853058
2.1.3 Email	heather.robertson@st.com
2.2 Change responsibility	
2.2.1 Product Manager	Ricardo Antonio DE SA EARP
2.1.2 Marketing Manager	Veronique BARLATIER
2.1.3 Quality Manager	Pascal NARCHE

### 3. Change

3.1 Category	3.2 Type of change	3.3 Manufacturing Location
Materials	New direct material part number (same supplier, different supplier or new supplier), Lead frame base material	ST MUAR (Malaysia)

### 4. Description of change

	Old	New
4.1 Description	Leadframe without Lead Lock Tape	Leadframe with Lead Lock Tape (LLT)
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	no impact	

### 5. Reason / motivation for change

5.1 Motivation	New state of the art technic
5.2 Customer Benefit	SERVICE IMPROVEMENT

### 6. Marking of parts / traceability of change

6.1 Description	tracability ensure by ST internal tool
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### 7. Timing / schedule

7.1 Date of qualification results	2023-05-24
7.2 Intended start of delivery	2023-08-16
7.3 Qualification sample available?	Not Applicable

### 8. Qualification / Validation

8.1 Description	14159 MDG-MCD-RER2022 V2.0 - PCI12541 PCI14159 - ST Muar (Malaysia) LQFP14x14 package leadframe enhancement.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2023-07-04

### 9. Attachments (additional documentations)

<b>10. Affected parts</b>		
<b>10.1 Current</b>		<b>10.2 New (if applicable)</b>
<b>10.1.1 Customer Part No</b>	<b>10.1.2 Supplier Part No</b>	<b>10.1.2 Supplier Part No</b>
	STM32F413VGT3	
	STM32F413VGT6	
	STM32F413VHT6	
	STM32F423VHT6	

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# Reliability Evaluation Report

## MDG-MCD- RERMCD2022

### ST Muar (Malaysia) LQFP14x14 package leadframe enhancement

(PCI 12541)  
 (PCI 14159)

General Information		Traceability	
<b>Commercial Product</b>	<i>STM32F207VGT6</i> <i>STM32F405VGT6</i> <i>STM32L476VGT6</i> <i>STM32F103VGT6</i>	<b>Diffusion Plant</b>	<i>TSMC FAB 14 TAIWAN</i> <i>TSMC FAB 8 TAIWAN</i> <i>ST Crolles 300 FRANCE</i>
<b>Product Line</b>	<i>411, 413, 415, 430</i>	<b>Assembly Plant</b>	<i>: ST Muar MALAYSIA</i>
<b>Die revision</b>	<i>411XXX3, 413XXX4, 415XXX4, X430XXX1</i>		
Reliability Assessment			
<b>Division</b>	<i>: MDG-GPM</i>	<b>Pass</b>	<input checked="" type="checkbox"/>
		<b>Fail</b>	<input type="checkbox"/>
		<b>Investigation required</b>	<input type="checkbox"/>

**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	10 <sup>th</sup> February 2021	Lionel NEVORET	MDG-MCD-Q&R Engineer
2.0	12 <sup>th</sup> June 2023	Lionel NEVORET	MDG-GPM-Q&R Engineer

**APPROVED BY:**

<b>Approval List V1.0</b>			
<b>Function</b>	<b>Location</b>	<b>Name</b>	<b>Date</b>
B.E. Quality Manager	Rousset	Gisèle SEUBE	10 <sup>th</sup> February 2021
Division Quality Manager	Rousset	Pascal NARCHE	10 <sup>th</sup> February 2021
<b>Approval List V2.0</b>			
B.E. Quality Manager	Rousset	Bérengère ROUTIER-SCAPPUCCI	13 <sup>th</sup> June 2023
Division Quality Manager	Rousset	Pascal NARCHE	13 <sup>th</sup> June 2023

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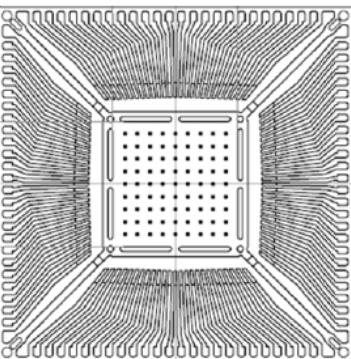
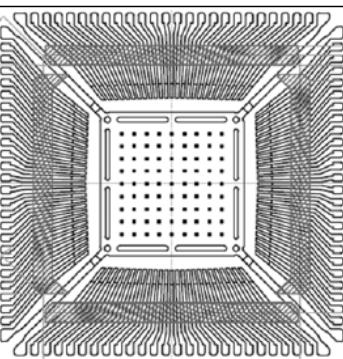
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## 1 RELIABILITY EVALUATION OVERVIEW

### 1.1 Objective

The aim of this report is to present results of the reliability evaluation performed on STM32 – Die 411/413/415/430 in package LQFP 14x14 100L with Lead Lock Tape at ST Muar.

Changes are described here below:

	Current back-end material	New back-end material
Assembly site	ST Muar (Malaysia)	
Die Pad Drawing		 <p>same drawing dimensions but LeadLockTape added</p>

### 1.2 Reliability Strategy

Test vehicles are described here below:

Product	Die	Process, Package	Assembly plant
STM32F103VGT6	430	TSMC 0.18, LQFP 100 14x14x1.4	ST Muar (Malaysia)
STM32F207VGT6	411	TSMC M10, LQFP 100 14x14x1.4 .4	ST Muar (Malaysia)
STM32F405VGT6	413	TSMC M10, LQFP 100 14x14x1.4 .4	ST Muar (Malaysia)
STM32L476VGT6	415	TSMC 90, LQFP 100 14x14x1.4 .4	ST Muar (Malaysia)

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.

As LQFP14x14 100L is already qualified in Muar using M10 Crolles300 FE technology (MDG – MCD RER1604) and according to good reliability tests results in line with reliability strategy, the qualification is granted for the STM32 in LQFP 14x14 100L with Lead Lock Tape package.

Refer to Section 3.0 for reliability test results.

## 2 PRODUCT OR TEST VEHICLE CHARACTERISTICS

### 2.1 Generalities

#### 2.1.1 Package Test vehicles

Package line	Assembly Line	Package	Device (Partial RawLine Code)	Diffusion Plants & Process	Number of Reliability Lots
LQFP	ST Muar	LQFP 14*14 100L	STM32 (1L*430)	TSMC 0.18 TSMC Fab8	1
			STM32 (1L*415)	TSMC 90 TSMC Fab14	1
			STM32 (1L*411)	TSMC M10 TSMC Fab14	1
			STM32 (1L*413)	TSMC M10 TSMC Fab14	1

### 2.2 Traceability

#### 2.2.1 Wafer fab information

Table 1

Wafer fab information				
FAB	Die 411	Die 413	Die 415	Die 430
Wafer fab name / location	TSMC Fab14 Taiwan	TSMC Fab14 Taiwan	TSMC Fab14 Taiwan	TSMC Fab8 Taiwan
Wafer diameter (inches)	12"	12"	12"	8"
Wafer thickness (µm)	775	775	775	381
Silicon process technology	TSMC M10	TSMC M10	TSMC 90	TSMC 0.18
Number of masks	43	43	44	33
Die finishing front side (passivation) materials	USG + NITRIDE	USG + NITRIDE	PSG + NITRIDE	HDPox 10kA+SRO
Die finishing back side Materials	RAW SILICON			
Die area (Stepping die size) (µm)	4006,3674	4004,4258	3794.4,4443.4	5384,5244
Die pad size (µm)	59,123 63,73	59,123 63,73	59,123	65, 70
Sawing street width (X,Y) (µm)	80, 80	80, 80	80, 80	80, 80
Metal levels/Materials/Thicknesses	Metal 1 TaN/Ta/CuSeed/Cu 0.220 µm	Metal 1 TaN/Ta/CuSeed/Cu 0.220 µm	Metal 1 TaN/Ta/Cu 0.240µm Metal 2 TaN/Ta/Cu 0.310µm Metal 3	Metal 1 Tin/AlCu/Tin 0.450 µm Metal 2

Metal 2 TaN/Ta/CuSeed/Cu 0.280 µm Metal 3 TaN/Ta/CuSeed/Cu 0.280 µm Metal 4 TaN/Ta/CuSeed/Cu 0.280 µm Metal 5 TaN/Ta/CuSeed/Cu 0.280 µm Metal 6 Ta/TaN/AlCu 0.730 µm Metal 7 AlCu 1.200 µm	Metal 2 TaN/Ta/CuSeed/Cu 0.280 µm Metal 3 TaN/Ta/CuSeed/Cu 0.280 µm Metal 4 TaN/Ta/CuSeed/Cu 0.280 µm Metal 5 TaN/Ta/CuSeed/Cu 0.280 µm Metal 6 TaN/Ta/Cu 0.310µm Metal 7 AlCu 1.450µm	TaN/Ta/Cu 0.310µm Metal 4 TaN/Ta/Cu 0.310µm Metal 5 TaN/Ta/Cu 0.310µm Metal 6 TaN/Ta/Cu 0.850µm Metal 7 AlCu 1.450µm	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
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## 2.2.2 Assembly information

Table 2

Assembly Information - Die 411	
<b>Package - 1L LQFP 100 14x14x1.4</b>	
Assembly plant name / location	ST MUAR MALAYSIA
Die thickness after back-grinding (µm)	375
Die sawing method	LG+Mechanical
Bill of Material elements	
Lead frame/Substrate material/reference	FRAME LQFP 100L 14SQ 5.2sqOpB
Lead frame finishing (material)	RgAg+CuOx
Die attach material/type(glue/film)/supplier	GLUE LOCTITE ABLESTIK ABP8302
Wire bonding material/diameter	WIRE Ag 96.5% D0.8
Molding compound material/supplier/reference	RESIN SUMITOMO EME-G700LS
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL3

Assembly Information - Die 413	
<b>Package - 1L LQFP 100 14x14x1.4</b>	
Assembly plant name / location	ST MUAR MALAYSIA
Die thickness after back-grinding (µm)	375
Die sawing method	LG+Mechanical
Bill of Material elements	
Lead frame/Substrate material/reference	FRAME LQFP 100L 14SQ 5.2sqOpB
Lead frame finishing (material)	RgAg+CuOx
Die attach material/type(glue/film)/supplier	GLUE LOCTITE ABLESTIK ABP8302
Wire bonding material/diameter	WIRE Ag 96.5% D0.8
Molding compound material/supplier/reference	RESIN SUMITOMO EME-G700LS

Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL3
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<b>Assembly Information - Die 415</b>	
<b>Package - 1L LQFP 100 14x14x1.4</b>	
Assembly plant name / location	ST MUAR MALAYSIA
Die thickness after back-grinding (µm)	375
Die sawing method	LG+Mechanical
Bill of Material elements	
Lead frame/Substrate material/reference	FRAME LQFP 100L 14SQ 5.2sqOpB
Lead frame finishing (material)	RgAg+CuOx
Die attach material/type(glue/film)/supplier	GLUE LOCTITE ABLESTIK ABP8302
Wire bonding material/diameter	WIRE Ag 96.5% D0.8
Molding compound material/supplier/reference	RESIN SUMITOMO EME-G700LS
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL3

<b>Assembly Information - Die 430</b>	
<b>Package - 1L LQFP 100 14x14x1.4</b>	
Assembly plant name / location	ST MUAR MALAYSIA
Die thickness after back-grinding (µm)	375
Die sawing method	Mechanical
Bill of Material elements	
Lead frame/Substrate material/reference	FRAME LQFP 100L 14SQ 6.6sqOpC
Lead frame finishing (material)	RgAg+CuOx
Die attach material/type(glue/film)/supplier	GLUE LOCTITE ABLESTIK ABP8302
Wire bonding material/diameter	WIRE Ag 96.5% D0.8
Molding compound material/supplier/reference	RESIN SUMITOMO EME-G700LS
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL3

## 2.2.3 Reliability testing information

**Table 3**

<b>Reliability Testing Information</b>	
Reliability laboratory name / location	ST Muar & ST Grenoble

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](http://www.st.com/content/st_com/en/support/quality-and-reliability/certifications.html)

### 3 TESTS RESULTS SUMMARY

#### 3.1 Lot Information

**Table 4**

Lot #	Diffusion Lot / Wafer ID	Assy Lot / Trace Code	Raw Line	Package	Note
1	9R908256	990180WR02/990180WR	901L*411ISX3	LQFP 14x14 100L	Package Reliability assessment
2	9R928105	990180WS02/990180WS	901L*413ISX4		Package Reliability assessment
3	9R951031	990180WQ02/990180WQ	931L*415ISX4		Package Reliability assessment
4	98001001	990180WTRR/990180WT	941L*430ISX1		Package Reliability assessment

### 3.2 Test plan and results summary

**Table 6 – ACCELERATED ENVIRONMENT STRESS TESTS**

Test code	Stress method	Stress Conditions	Lots	S.S.	Total	Results/ Lot Fail/S.S.	Comments: (N/A =Not Applicable)
PC	J-STD-020	24h bake@125°C, MSL3 (192h@30C/60%RH) 3x Reflow simulation Peak Reflow Temp= 260°C	4	231	924	Lot1: 0/231 Lot2: 0/231 Lot3: 0/231 Lot4: 0/231	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc  ☒ After PC	4	77	308	Lot 1: 0/77 Lot 2: 0/77 Lot 3: 0/77 Lot 4: 0/77	
AC	JESD22-A102	Ta=121°C ,100% RH 2 atm Duration= 96hrs  ☒ After PC	4	77	308	Lot 1: 0/77 Lot 2: 0/77 Lot 3: 0/77 Lot 4: 0/77	
HTSL	JESD 22-A103	Ta=150°C, Duration= 1000hrs	4	77	308	Lot 1: 0/77 Lot 2: 0/77 Lot 3: 0/77 Lot 4: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 Duration= 1000hrs  ☒ After PC	4	77	308	Lot 1: 0/77 Lot 2: 0/77 Lot 3: 0/77 Lot 4: 0/77	

**Table 7 – ELECTRICAL VERIFICATION TESTS**

Test code	Stress method	Stress Conditions	Lots	S.S.	Total	Results/ Lot Fail/S.S.	Comments: (N/A =Not Applicable)
ESD CDM	JESD22-C101	250V	4	3	12	Lot 1: 0/3 Lot 2: 0/3 Lot 3: 0/3 Lot 4: 0/3	

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

**Table 8 – PACKAGE ASSEMBLY INTEGRITY TESTS**

Test code	Method	Tests Conditions	Lots	S.S.	Total	Results/ Lot Fail/S.S.	Comments: (N/A =Not Applicable)
CA	Construction Analysis including –Solderability – POA	JESD 22B102 JESD B100	4	50	200	Lot 1: 0/50 Lot 2: 0/50 Lot 3: 0/50 Lot 4: 0/50	PASS CA-30-0720

## 4 APPLICABLE AND REFERENCE DOCUMENTS

Reference	Short description
<b>JESD47</b>	Stress–Test–Driven Qualification of Integrated Circuits
<b>SOP2.4.4</b>	Record Management Procedure
<b>SOP2.6.2</b>	Internal Change Management
<b>SOP2.6.7</b>	Finished Good Maturity Management
<b>SOP2.6.9</b>	Package & Process Maturity Management in BE
<b>SOP2.6.11</b>	Program Management for Product Development
<b>SOP2.6.17</b>	Management of Manufacturing Transfers
<b>SOP2.6.19</b>	Front–End Technology Platform Development and Qualification
<b>DMS 0061692</b>	Reliability Tests and Criteria for Product Qualification
<b>JESD22–C101</b>	Electrostatic discharge (ESD) sensitivity testing charge device model (CDM)
<b>JESD78</b>	IC Latch-up test
<b>JESD 22–A108</b>	Temperature, Bias and Operating Life
<b>JESD 22–A117</b>	Endurance and Data retention
<b>JESD 22–A103</b>	High Temperature Storage Life
<b>J–STD–020:</b>	Moisture/reflow sensitivity classification for non–hermetic solid state surface mount devices
<b>JESD22–A113:</b>	Preconditioning of non–hermetic surface mount devices prior to reliability testing
<b>JESD22–A102:</b>	Autoclave test (pressure pot)
<b>JESD22–A104:</b>	Temperature cycling
<b>JESD22–A101:</b>	Temperature Humidity Bias
<b>JESD 22B102:</b>	Solderability test
<b>JESD22B100/B108:</b>	Physical dimension

## 5 GLOSSARY

Reference	Short description
PC	Preconditioning (solder simulation)
THB	Temperature Humidity Bias
TC	Temperature cycling
AC	Autoclave
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	L. Nevoret	Initial release	Div. Quality Manager	Rousset	Pascal NARCHE	10 <sup>th</sup> February 2021
1.0	L. Nevoret	Initial release	B.E Quality Manager	Rousset	Gisele SEUBE	10 <sup>th</sup> February 2021
2.0	L. Nevoret	Die 463	Div. Quality Manager	Rousset	Pascal NARCHE	13 <sup>th</sup> June 2023
2.0	L. Nevoret	DIE 463	B.E Quality Manager	Rousset	Bérengère ROUTIER-SCAPPUCCI	13 <sup>th</sup> June 2023

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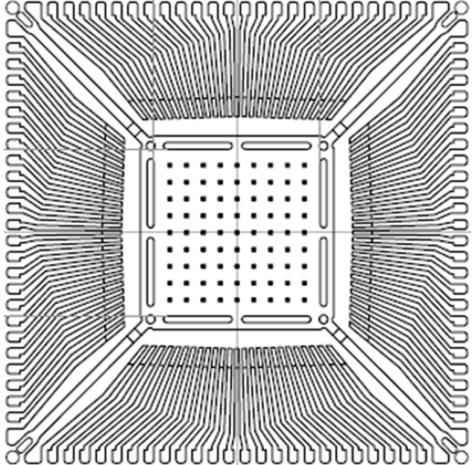
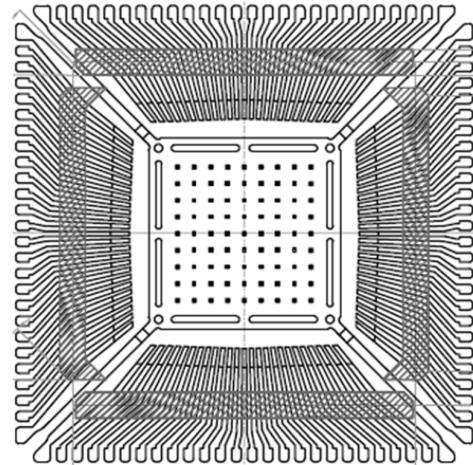
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**PRODUCT/PROCESS  
CHANGE NOTIFICATION  
PCI14159– Additional information**

**ST Muar (Malaysia) LQFP14x14 package leadframe enhancement  
for STM32F4xx listed products**

**MDG - Microcontrollers Division (MCD)**

**What is the change?**

	Current back-end material	New back-end material
Assembly site		ST Muar (Malaysia)
Die Pad Drawing		 <p>same drawing dimensions but LeadLockTape added</p>

**How can the change be seen?**

Tracability ensured by ST internal tool.



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**PCI Title :** ST MUAR (Malaysia) LQFP14x14 package leadframe enhancement for STM32F4xx listed products

**PCI Reference :** MDG/23/14159

**Subject :** Public Products List

Dear Customer,

Please find below the Standard Public Products List impacted by the change.

STM32F413VGT6TR	STM32F423VHT6TR	STM32F413VGT6
STM32F423VHT6	STM32F413VHT6	STM32F413VGT3
STM32F413VGT3TR		

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