



# PRODUCT/PROCESS CHANGE NOTIFICATION

## PCN 11871 – Additional information

### STM32G4 products

#### MDG - Microcontrollers Division (MCD)

#### What are the changes?

Changes described in the below two tables:

Die revision change as well as Mount & Bonding Diagram (MBD)

#### Assembly site is Amkor ATP

		Assembly site		
		Amkor ATP (The Philippines)		
		Before	After	
STM32G431x -STM32G441x		Die version	Version Z	Version Y
Package	LQFP 100 14x14	Leadframe	5FT5900	5FT5457
		MBD		6 additional ground wires
STM32G47x -STM32G48x		Die version	Version Z	Version Y
Package	LQFP 100 14x14	Leadframe	5FT5900	5FT3349
		MBD		8 additional ground wires
	LQFP 128 14x14	MBD		No change

### Assembly site is StatsChippac JSCC

		Assembly site		
		StatsChippac JSCC (China)		
		Before	After	
STM32G431x -STM32G441x		Die version	Version Z	Version Y
Package	LQFP 32 7x7	MBD		4 additional ground wires
	LQFP 48 7x7	MBD		4 additional ground wires
	LQFP 64 10x10	MBD		6 additional ground wires
		Leadframe	LFT9232	LFT0018
	UFQFPN 32 5X5	MBD		No change
	UFQFPN 48 7X7	MBD		No change

STM32G47x -STM32G48x		Die version	Version Z	Version Y
Package	LQFP 48 7x7	MBD		6 additional ground wires
	LQFP 64 10x10	MBD		8 additional ground wires
		Leadframe	LFT9232	LFT0018
	UFQFPN 48 7X7	MBD		No change

### How can the change be seen?

The standard marking is



**PP** code indicates the Assembly traceability plant code.

PP code	Assembly Plant
7B	Amkor ATP (The Philippines)
GQ	Stats ChipPAC JSCC (China)

**K** code indicates the silicon version

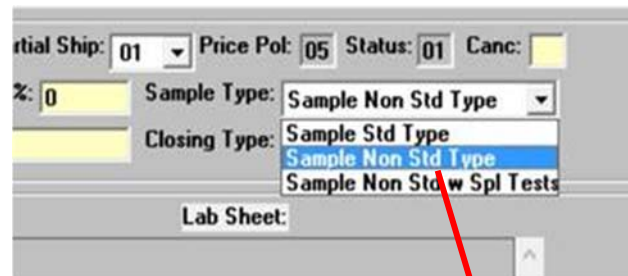
Before		After	
K code	Cut version	K code	Cut version
Z	Cut 2.1	Y	Cut 2.2

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 11871**” into the NPO Electronic Sheet/**Regional Sheet**
- request sample(s) through Notice tool, indicating a single Commercial Product for each request

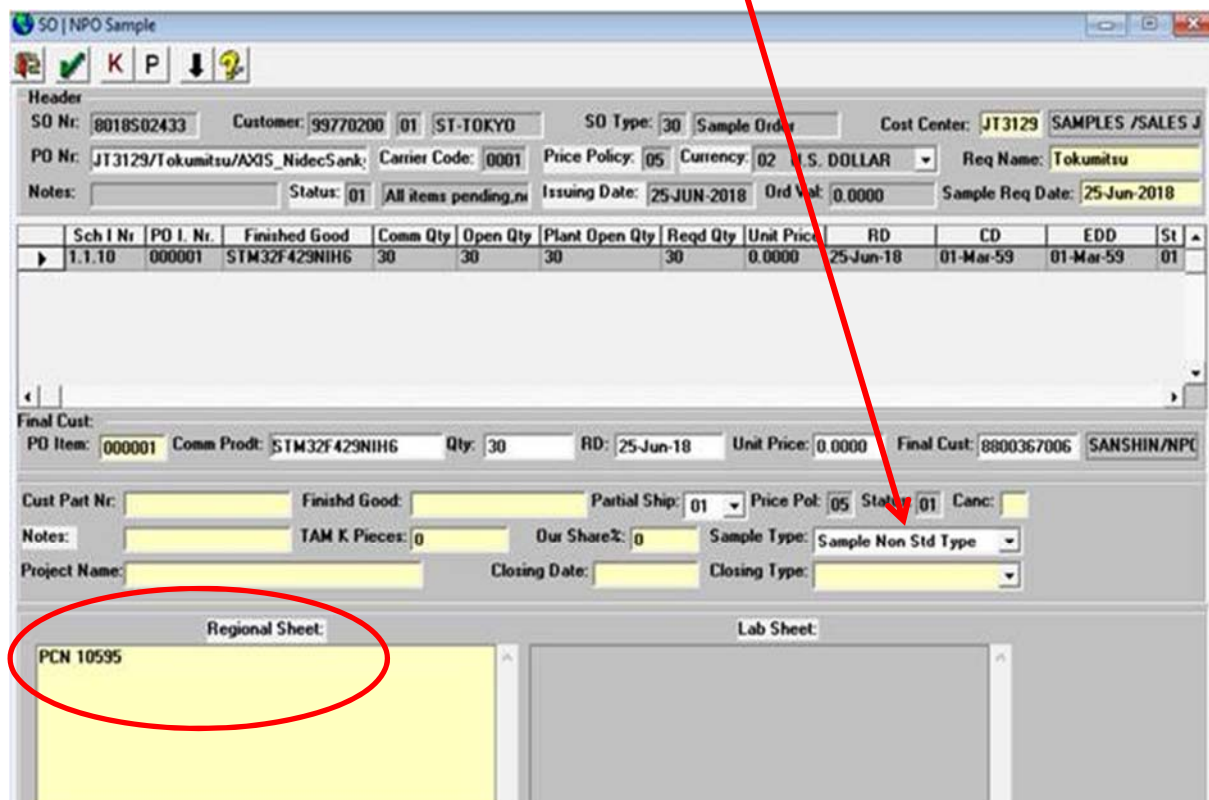


Partial Ship: 01 Price Pol: 05 Status: 01 Canc:

%: 0 Sample Type: Sample Non Std Type

Closing Type: Sample Std Type  
 Sample Non Std Type  
 Sample Non Std w Spl Tests

Lab Sheet:



SO | NPO Sample

Header  
 SO Nr: 8018502433 Customer: 99770200 01 ST-TOKYO SO Type: 30 Sample Order Cost Center: JT3129 SAMPLES /SALES J  
 PO Nr: JT3129/Tokumitsu/AXIS\_NidecSank Carrier Code: 0001 Price Policy: 05 Currency: 02 U.S. DOLLAR Req Name: Tokumitsu  
 Notes: Status: 01 All items pending,ni Issuing Date: 25-JUN-2018 Ord Val: 0.0000 Sample Req Date: 25-Jun-2018

Sch I Nr	PO I. Nr.	Finished Good	Comm Qty	Open Qty	Plant Open Qty	Reqd Qty	Unit Price	RD	CD	EDD	St
1.1.10	000001	STM32F429NIH6	30	30	30	30	0.0000	25-Jun-18	01-Mar-59	01-Mar-59	01

Final Cust:  
 PO Item: 000001 Comm Prod: STM32F429NIH6 Qty: 30 RD: 25-Jun-18 Unit Price: 0.0000 Final Cust: 8800367006 SANSHIN/NPC

Cust Part Nr: Finished Good: Partial Ship: 01 Price Pol: 05 Status: 01 Canc:

Notes: TAM K Pieces: 0 Our Share%: 0 Sample Type: Sample Non Std Type

Project Name: Closing Date: Closing Type:

Regional Sheet: PCN 10595

Lab Sheet:



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# Reliability Evaluation Report

## MDG–MCD–RER1904

STM32G431 /G441 /GBK1x (468x66)  
 Reliability Evaluation Purpose (New Product Qualification)

General Information		Traceability	
<b>Commercial Product</b>	STM32G431/G441/GBK1 x6/x8/xB	<b>Diffusion Plant</b>	TSMC Fab14, Taiwan.
<b>Product Line</b>	468X66	<b>Assembly Plant</b>	SC AMKOR ATP1, Philippines. SC AMKOR ATP3, Philippines. AMKOR ATT1, Taiwan. JSCC, China.
<b>Die revision</b>	468XXXY (Cut2.2)		
<b>Product Description</b>	STM32G431/G441/GBK1x family		
<b>Package</b>	LQFP14x14 100L, LQFP12x12 80L LQFP10x10 64L, LQFP7x7 48L LQFP7x7 32L, UFBGA5x5 64L, UFQFPN7x7 48L, UFQFPN5x5 32L, WLCSP49	<b>Reliability Assessment</b>	
<b>Silicon Technology</b>	TSMC Fab14 90ULL	<b>Pass</b>	<input checked="" type="checkbox"/>
<b>Division</b>	MDG–MCD	<b>Fail</b>	<input type="checkbox"/>
<b>Reliability Maturity Level</b>	30	<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	15 <sup>th</sup> Feb 2019	Moses TAN	MDG–MCD–Q&R Engineer
1.1	10 <sup>th</sup> Dec 2019	Moses TAN	MDG–MCD–Q&R Engineer

### APPROVED BY:

Function	Location	Name	Date
Version 1.0 Division Q&R Manager	Grenoble	Dominique GALIANO	26 <sup>th</sup> –Feb–2019
	Rousset	Frederic BRAVARD	18 <sup>th</sup> –Feb–2019
Version 1.0 Division Quality Manager	Rousset	Pascal NARCHE	28 <sup>th</sup> –Feb–2019

Version 1.1 Division Q&R Manager	Grenoble	Dominique GALIANO	10th Dec 2019
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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 STM32G431/G441/GBK1 x6/x8/xB – Die 468XXXZ.

Test vehicle is described here below:

Product	Process / Package	Diffusion / Assembly plant
STM32G431VBT6	90ULL, LQFP 14x14 100L	TSMC Fab14 , SC AMKOR ATP1
STM32G431MBT6	90ULL, LQFP 12x12 80L	TSMC Fab14 , JSCC
STM32G431RBT6	90ULL, LQFP 10x10 64L	TSMC Fab14 , JSCC
STM32G431CBT6	90ULL, LQFP 7x7 48L	TSMC Fab14 , JSCC
STM32GBK1CBT6	90ULL, LQFP 7x7 48L	TSMC FAB14, JSCC
STM32G431KBT6	90ULL, LQFP 7x7 32L	TSMC Fab14 , JSCC
STM32G431CBU6	90ULL, UFQFPN 7x7 48L	TSMC Fab14 , JSCC
STM32G431KBU6	90ULL, UFQFPN 5x5 32L	TSMC Fab14 , JSCC
STM32G431RBI6	90ULL, UFBGA 5x5 64L	TSMC Fab14 , SC AMKOR ATP3
STM32G431CBY6TR	90ULL, WLCSP 49L	TSMC Fab14 , SC AMKOR ATT1

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

### 1.2 Reliability Strategy

The STM32G431/G441/GBK1 x6/x8/xB – Die 468XXXZ, is processed in the 90ULL process from TSMC Fab14 Taiwan plant which is qualified through ORCA 1M – Die 415 (RERMCD1112) for our division.

All packages, except the LQFP12x12 80L, used for this product, are qualified at division level.

Specific reliability exercise is planned to assess the LQFP12x12 80L with 2 product drivers (STM32G431x – Die 468 & STM32G474 – Die 469).

Package	Reference	Assy Plant location
LQFP14x14 100L	RERMCD1312 / RERMCD1112	AMKOR ATP1
LQFP12x12 80L	RERMCD1818	JSCC, China
LQFP10x10 64L	RERMCD1621	JSCC, China
LQFP7x7 48L	RERMCD1621	JSCC, China
LQFP7x7 32L	RERMCD1621	JSCC, China
UFQFPN 7x7 48L	RERMCD1622	JSCC, China
UFQFPN 5x5 32L	RERMCD1622	JSCC, China

UFBGA5x5 64L	RERMCD1402	AMKOR ATP3
WLCSP 49	RERMCD1803	AMKOR ATT1

According to “RELIABILITY TESTS AND CRITERIA FOR QUALIFICATION” specification (DMS 0061692), the following qualification strategy has been defined:

- Die Qualification:
  - Cut1.0:1 full qualification lot to assess the die in LQFP100 package.
  - Cut2.0:1 full qualification lot to assess the die in LQFP100 package.
  - Cut2.1:1 subset qualification lot to assess the die in LQFP100 package.
  - Cut2.2:1 subset qualification lot to assess the die in LQFP100 package.

- Package Qualification:

The reliability test plan and result summary are presented in the following tables:

Package	Body	Pitch	Package Code	Wire	Assembly	Bonding Option	Trial
LQFP 100	14x14	0.5	1L	Gold	ATP1		CDM only
LQFP 80	12x12	0.5	9X	Silver/ULA	JSCC		2 reliability lots
LQFP 64	10x10	0.5	5W	Silver/ULA	JSCC		CDM only
LQFP 48	7x7	0.5	5B	Silver/ULA	JSCC		CDM only
LQFP 32	7x7	0.5	5V	Silver/ULA	JSCC		CDM only
UFBGA 64L	5x5	0.5	A019	Gold	ATP3		1 reliability lot
UFQFPN 48L	7x7	0.5	A0B9	Silver	JSCC		CDM only
UFQFPN 32L	5x5	0.5	A0B8	Silver	JSCC		CDM only
WLCSP49	-	0.4	B03Q	-	ATT1		1 reliability lot

### 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 validated product mission profile and reliability strategy, the qualification is granted for the STM32G431/G441/GBK1 x6/x8/xB – Die 468XXXY in all packages listed in the Chapter 1.2, except for the LQFP12x12 80L.

Report will be updated when new reliability results are available

Refer to Section 3.0 for reliability test results.

## 2 PRODUCT OR TEST VEHICLE CHARACTERISTICS

### 2.1 Generalities

STM32G431x product is based on Arm® 32-bit Cortex®-M4 CPU with FPU, Adaptive real-time accelerator (ART Accelerator™) allowing 0-wait-state execution from Flash memory, frequency up to 170 MHz with 213 DMIPS, MPU, DSP instructions. There are 128 Kbytes of Flash memory with ECC support, 2 16-bits resolution ADC, 4 12-bit DAC, 4 ultra-fast comparators, 3 operational amplifiers, 14 timers, and USB Type-C power delivery controller in this product.

For additional information concerning the product behavior, refer to STM32G431x datasheets.

### 2.2 Traceability

#### 2.2.1 Wafer fab information

**Table 1**

Wafer fab information	
<b>FAB1</b>	
Wafer fab name / location	TSMC Fab14 / Taiwan
Wafer diameter (inches)	12
Wafer thickness (µm)	775 +/- 25
Silicon process technology	90nm eFlash Generic TSMC
Number of masks	43
Die finishing front side (passivation) materials/thicknesses (µm)	PSG + NITRIDE, 1.1
Die area (Stepping die size) (µm)	3152.4, 3167.8
Die pad size (X,Y) (µm)	123, 59
Sawing street width (X,Y) (µm)	80, 80
Metal levels/Materials/Thicknesses (µm)	Metal 1 Cu 0.24 / Metal 2 Cu 0.31 / Metal 3 Cu 0.31 Metal 4 Cu 0.31 / Metal 5 Cu 0.31 / Metal 6 Cu 0.85 Metal 7 AlCu 1.45
Die over coating (material/thickness)	No
FIT level (Ea=0.7eV, C.L: 60%, 55°C)	3.1 FITs at qualification date.
Soft Error Rate - Alpha SER [FIT/Mb] - Neutron SER [FIT/Mb] - Conditions	Alpha SER: 491 FIT/Mb Neutron SER: 445 FIT/Mb Neutron SER is an estimation at sea level of NYC (14n/h/cm²). Alpha result is estimated using a nominal flux of 0.001α/h/cm²
Wafer Level Reliability - Electro-Migration (EM) - Time Dependent Dielectric Breakdown (TDDB) or Gate Oxide Integrity (GOI) - Hot Carrier Injection (HCI) - Negative Bias Thermal Instability (NBTI) - Stress Migration (SM)	Yes
Other Device(s) using same process	STM32L4x product family, 415, 435, 461, 462, 464, 470

## 2.2.2 Assembly information

Table 2

Assembly Information	
<b>Package 1 - LQFP 14x14x1.4 100L 1L</b>	
Assembly plant name / location	SC AMKOR ATP1, Philippine.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material/supplier/reference	LQFP14x14 100L PPF 5sq SID#101389126
Die attach material/type(glue/film)/supplier	GLUE SUMITOMO EPOXY CRM 1076YB
Wire bonding material/diameter/supplier	GOLD WIRE 0.8MIL
Molding compound material/supplier/reference	Resin Sumitomo G631HQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
<b>Package 2 - LQFP 12x12x1.4 80L 9X</b>	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LQ12 80L 208sq eff slot Etch LF JSCC
Die attach material/type(glue/film)/supplier	D/A Ablestik 3230
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	Mold Sumitomo low alpha G631SHQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
<b>Package 3 - LQFP 10x10x1.4 64L 5W</b>	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LQFP64 236sq no slots STMP LF JSCC
Die attach material/type(glue/film)/supplier	D/A Ablestik 3230
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	Mold Sumitomo low alpha G631SHQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3

Package 4 – LQFP 7x7x1.4 48 5B	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LQFP48L 184sq Eff slots pur tin STMP LF JSCC
Die attach material/type(glue/film)/supplier	D/A Ablestik 3230
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	Mold Sumitomo low alpha G631SHQ
Package Moisture Sensitivity Level (JEDEC J–STD020D)	MSL 3
Package 5 – LQFP 7x7x1.4 32 5V	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LQ7 32L 184sq Eff slots STMP LF JSCC
Die attach material/type(glue/film)/supplier	D/A Ablestik 3230
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	Mold Sumitomo low alpha G631SHQ
Package Moisture Sensitivity Level (JEDEC J–STD020D)	MSL 3
Package 6 – UFBGA 5x5x0.6 64 A019	
Assembly plant name / location	SC AMKOR ATP1, Philippine.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	75 +/- 12
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Substrate material/supplier/reference	SUBSTRATE UFBGA 5X5 64L SID#101405840
Die attach material/type(glue/film)/supplier	DAF Ablestik ATB130U
Wire bonding material/diameter/supplier	WIRE GOLD DIAM. 0.8 MIL
Balls metallurgy/diameter/supplier (BGA/CSP)	SOLDER BALLS WITH 200um DIAM SN96.5 AG3.5%
Molding compound material/supplier/reference	MOLDING COMPOUND GE100LFCS
Package Moisture Sensitivity Level (JEDEC J–STD020D)	MSL 3

Package 7 - UFQFPN 7x7x0.55 48L A0B9	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	150 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LF FOR UQFN 7x7 48L Sn PAD 5.2 MM SQ Groove
Die attach material/type(glue/film)/supplier	GLUE ABLEBOND 8290
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	RESIN SUMITOMO G770
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
Package 8 - UFQFPN 5x5x0.55 32L A0B8	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	150 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LF FOR UQFN 5x5 32L Sn PAD 3.7 MM SQ
Die attach material/type(glue/film)/supplier	GLUE ABLEBOND 8290
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	RESIN SUMITOMO G770
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
Package 9 - WLCSP 49 B03Q	
Assembly plant name / location	SC AMKOR ATT1, Taiwan.
Pitch (mm)	0.4
Die thickness after back-grinding (µm)	355 +/- 25
Die sawing method	Laser Groove
<b>Bill of Material elements</b>	
PBO material/reference	Passivation HD8820
RDL	Copper
UBM	Ti/Cu/Cu
Balls metallurgy/diameter/supplier (BGA/CSP)	Solder ball SAC405 Diam 230um
Backside Coating material/supplier/reference	Back side coating PET film
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 1

### 2.2.3 Reliability testing information

**Table 3**

Reliability Testing Information	
Reliability laboratory name / location	ST GRAL in 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	Die Revision (Cut)	Assy Lot / Trace Code	Raw Line	Package	Note
1	9R742036 Wafer#2	1.0	7B809834	P01L*468ESXA	LQFP 14x14 100L	Die Reliability assessment.
2	9R829134 Wafer#2	2.0	7B839734	P01L*468ESXB	LQFP 14x14 100L	Die Reliability assessment.
3	9R829137 Wafer#3	2.1	7B901542	P01L*468ESXZ	LQFP 14x14 100L	Die Reliability assessment.
4	9R928234 Wafer#1	2.2	7B940656	P01L*468ESXY	LQFP 14x14 100L	Die Reliability assessment.
5	9R928234 Wafer#7	2.2	GQ943295	S09X*468ISXY	LQFP 12x12 80L	Package Reliability assessment.
6	9R928234 Wafer#7	2.2	GQ94425K	S09X*468ISXY	LQFP 12x12 80L	Package Reliability assessment.
7	9R742036 Wafer#14	1.0	GQ81429F	S05W*468ISXA	LQFP 10x10 64L	Package Reliability assessment.
8	9R742036 Wafer#14	1.0	GQ81429D	S05B*468ISXA	LQFP 7x7 48L	Package Reliability assessment.
9	9R742036 Wafer#14	1.0	GQ821269	S35B*468ISXA	LQFP 7x7 48L (GBK1 option)	Package Reliability assessment.

10	9R742036 Wafer#14	1.0	GQ8142A9	S05V*468ISXA	LQFP 7x7 32L	Package Reliability assessment.
11	9R742036 Wafer#10	1.0	7B818A3R	P02I*468ESXA	UFBGA 5x5 64L	Package Reliability assessment.
12	9R742036 Wafer#14	1.0	GQ81426W	S0MI*468ISXA	UFQFPN 7x7 48L	Package Reliability assessment.
13	9R742036 Wafer#15	1.0	GQ81429G	S0MG*468ISXA	UFQFPN 5x5 32L	Package Reliability assessment.
14	9R742036 Wafer#12	1.0	A5814007	T0GV*468ESXA	WLCSP 49L	Package Reliability assessment.



### 3.2 Test plan and results summary

**Table 5 - ACCELERATED LIFETIME SIMULATION TESTS**

Test code	Stress method	Stress Conditions	Lots	S.S.	Total	Results/ Lot Fail/S S	Comments: (N/A =Not Applicable)
HTOL	JESD22 A108	Ta=125°C Duration= 1200H Vcore :1V28 Vdd : 3V6	2	77	154	Lot1: 0/77 Lot2: 0/77	
		Ta=125°C Duration= 168H Vcore :1V28 Vdd : 3V6	2	77	154	Lot3: 0/77 Lot4: 0/77	
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500 Ω, 100 pF 2kV class2	3	3	9	Lot1: 0/3 Lot2: 0/3 Lot3: 0/3 Lot4: 0/3	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	250V	3	3	9	Lot1: 0/3 Lot2: 0/3 Lot3: 0/3 Lot4: 0/3	
Latch Up	JESD78	130°C	3	3	9	Lot1: 0/3 Lot2: 0/3 Lot3: 0/3 Lot4: 0/3	
EDR	JESD22-A117	10kcy EW @ 125°C then Storage HTB 150°C - Duration 1500H	2	77	154	Lot1: 0/77 Lot2: 0/77	
		10kcy EW @ 125°C then Storage HTB 150°C - Duration 168H	1	77	77	Lot4: 0/77	
EDR	JESD22-A117	10kcy EW @ 25°C then Storage HTB 150°C - Duration 168h	3	77	234	Lot1: 0/77 Lot2: 0/77 Lot4: 0/77	
EDR	JESD22-A117	10kcy EW @ -40°C then Storage HTB 150°C - Duration 168H	3	77	234	Lot1: 0/77 Lot2: 0/77 Lot4: 0/77	
ELFR	JESD22-A108 JESD74	Ta=125°C Duration= 48hrs Vcore :1V28 Vdd : 3V6	2	500	1000	Lot1: 0/500 Lot2: 0/500	

**Table 6 – ACCELERATED ENVIRONMENT STRESS TESTS**

For LQFP 14x14 100L

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	

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

For LQFP 12x12 80L

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	2	308	616	Lot 5 Lot 6	Qualification in Q1-20
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc  <input checked="" type="checkbox"/> After PC	2	77	154	Lot 5 Lot 6	Qualification in Q1-20
HTSL	JESD 22-A103	Ta=150°C , Duration= 1000hrs  <input checked="" type="checkbox"/> After PC	2	77	154	Lot 5 Lot 6	Qualification in Q1-20
UHAST	JESD 22-A118	Ta=130°C ,85% RH Duration= 96hrs  <input checked="" type="checkbox"/> After PC	2	77	154	Lot 5 Lot 6	Qualification in Q1-20
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6  <input checked="" type="checkbox"/> After PC	2	77	154	Lot 5 Lot 6	Qualification in Q1-20
ESD CDM	ANSI/ESDA/ JEDEC JS-002	250V	1	3	3	Lot 5	Qualification in Q1-20

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

**For LQFP 10x10 64L**

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	1	3	3	Lot7: 0/3	

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

**For LQFP 7x7 48L**

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	1	3	3	Lot8: 0/3	

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

**For LQFP 7x7 48L (STM32GBK1x)**

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	1	3	3	Lot9: 0/3	

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

**For LQFP 7x7 32L**

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	1	3	3	Lot10: 0/3	

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

For UFBGA 5x5 64L

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	1	231	231	Lot 11: 0/231	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc <input checked="" type="checkbox"/> After PC	1	77	77	Lot 11: 0/77	
HTSL	JESD 22-A103	Ta=150°C , Duration= 1000hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot 11: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 <input checked="" type="checkbox"/> After PC	1	77	77	Lot 11: 0/77	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	250V	1	3	3	Lot11: 0/3	

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

For UFQFPN 7x7 48L

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	1	3	3	Lot12: 0/3	

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

For UFQFPN 5x5 32L

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	1	3	3	Lot13: 0/3	

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

For WLCSP 49

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, MSL1 (168h@85C/85%RH) 3x Reflow simulation Peak Reflow Temp= 260°C	1	308	308	Lot14 :0/308	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc <input checked="" type="checkbox"/> After PC	1	77	77	Lot14 : 0/77	
HTSL	JESD 22-A103	Ta=150°C , Duration= 1000hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot14 : 0/77	
UHAST	JESD 22-A118	Ta=130°C ,85% RH Duration= 96hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot14 : 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 <input checked="" type="checkbox"/> After PC	1	77	77	Lot14 : 0/77	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	250V	1	3	3	Lot14 : 0/3	

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

**Table 8 – PACKAGE ASSEMBLY INTEGRITY TESTS**

For LQFP 12x12 80L

Test code	Method	Tests 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 -Solderability	JESD 22B102 JESDB100/ B108	2	50	100	Lot5 Lot6	Qualification in Q1-20

#### 4 APPLICABLE AND REFERENCE DOCUMENTS

Reference	Short description
JESD47	Stress-Test-Driven Qualification of Integrated Circuits
SOP2.4.4	Record Management Procedure
SOP2.6.2	Internal Change Management
SOP2.6.7	Finished Good Maturity Management
SOP2.6.9	Package & Process Maturity Management in BE
SOP2.6.11	Program Management for Product Development
SOP2.6.17	Management of Manufacturing Transfers
SOP2.6.19	Front-End Technology Platform Development and Qualification
DMS 0061692	Reliability Tests and Criteria for Product Qualification
ANSI/ESDA JEDEC JS-001	Electrostatic discharge (ESD) sensitivity testing human body model (HBM)
ANSI/ESDA JEDEC JS-002	Electrostatic discharge (ESD) sensitivity testing charge device model (CDM)
JESD78	IC Latch-up test
JESD 22-A108	Temperature, Bias and Operating Life
JESD 22-A103	High Temperature Storage Life
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-A104:	Temperature cycling
JESD22-A110:	Temperature Humidity Bake
JESD 22B102:	Solderability test
JESD22B100/B108:	Physical dimension

## 5 GLOSSARY

Reference	Short description
HTOL	High Temperature Operating Life
EDR	Endurance and Data Retention
ELFR	Early Failure Rate
PC	Preconditioning (solder simulation)
THB	Temperature Humidity Bias
TC	Temperature cycling
uHAST	Unbiased Highly Accelerated Stress Test
HAST	Highly Accelerated Stress Test
HTSL	High temperature storage life
DMS	ST Advanced Documentation Controlled system/ Documentation Management system
ESD HBM	Electrostatic discharge (human body model)
ESD CDM	Electrostatic discharge (charge device model)
LU	Latch-up
CA	Construction Analysis

## 6 REVISION HISTORY

Revision	Author	Content description	Approval List			
			Function	Location	Name	Date
1.0	Moses TAN	Initial Release	Div. Quality Manager	Rousset	Pascal NARCHE	28 <sup>th</sup> -Feb-2019
			Q&R Quality Manager	Grenoble	Dominique GALIANO	26 <sup>th</sup> -Feb-2019
				Rousset	Frederic BRAVARD	18 <sup>th</sup> -Feb-2019
				Rousset	Frederic BRAVARD	13 <sup>th</sup> Mar 2019
1.1	Moses TAN	Updated with Reliability trial results on Cut 2.0, 2.1, 2.2	Q&R Quality Manager	Grenoble	Dominique GALIANO	10 <sup>th</sup> Dec 2019

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# Reliability Evaluation Report

## MDG-MCD-RER1703

STM32G471 /G473/G474/G483/G484  
(469x66)

Reliability Evaluation Purpose (New Product Qualification)

General Information	
Commercial Product	STM32G471/G473/G474 xB/xC/xE STM32G483/G484 xE
Product Line	469X66
Die revision	469XXXY (Cut2.2)
Product Description	STM32G47x / G48x family
Package	LQFP14x14 128L, LQFP14x14 100L LQFP12x12 80L, LQFP10x10 64L LQFP7x7 48L, TFBGA8x8 100L, UFQFPN7x7 48L, WLCSP81
Silicon Technology	TSMC Fab14 90ULL
Division	MDG-MCD
Reliability Maturity Level	30

Traceability	
Diffusion Plant	TSMC Fab14, Taiwan.
Assembly Plant	SC AMKOR ATP1, Philippines. SC AMKOR ATP3, Philippines. AMKOR ATT1, Taiwan. JSCC, China.
Reliability Assessment	
Pass	<input checked="" type="checkbox"/>
Fail	<input type="checkbox"/>
Investigation required	<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
2.0	29 <sup>th</sup> Jul 2019	Pascal CARDOSI	MDG-MCD-Q&R Engineer
2.1	4 <sup>th</sup> Dec 2019	Pascal CARDOSI	MDG-MCD-Q&R Engineer

**APPROVED BY:**

Function	Location	Name	Date
Division Q&R Manager	Rousset	Frederic BRAVARD	29 <sup>th</sup> -Jul-2019
	Grenoble	Dominique GALIANO	06-Dec -2020

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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 STM32G47x/G48x xB/xC/xE - Die 469XXXXY.

Test vehicle is described here below:

Product	Process / Package	Diffusion / Assembly plant
STM32G474QET6	90ULL, LQFP 14x14 128L	TSMC Fab14 , SC AMKOR ATP1
STM32G474VET6	90ULL, LQFP 14x14 100L	TSMC Fab14 , SC AMKOR ATP1
STM32G474MET6	90ULL, LQFP 12x12 80L	TSMC Fab14 , JSCC
STM32G474RET6	90ULL, LQFP 10x10 64L	TSMC Fab14 , JSCC
STM32G474CET6	90ULL, LQFP 7x7 48L	TSMC Fab14 , JSCC
STM32G474VEH6	90ULL, TFBGA 8x8 100L	TSMC Fab14 , SC AMKOR ATP3
STM32G474CEU6	90ULL, UFQFPN 7x7 48L	TSMC Fab14 , JSCC
STM32G474MEY6TR	90ULL, WLCSP 81L	TSMC Fab14 , SC AMKOR ATT1

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

### 1.2 Reliability Strategy

The STM32G47x/G48x xB/xC/xE - Die 469XXXXY, is processed in the 90ULL process from TSMC Fab14 Taiwan plant which is qualified through ORCA 1M - Die 415 (RERMCD1112) for our division.

All packages, except the LQFP12x12 80L, used for this product, are qualified at division level.

Specific reliability exercise is planned to assess the LQFP12x12 80L with 2 product drivers (STM32G431x - Die 468 & STM32G474x - Die 469).

Package	Reference	Assy Plant location
LQFP 14x14 128L	RERMCD1312 / RERMCD1703	AMKOR ATP1
LQFP 14x14 100L	RERMCD1312 / RERMCD1112	AMKOR ATP1
LQFP 12x12 80L	RERMCD1818	JSCC, China
LQFP 10x10 64L	RERMCD1621	JSCC, China
LQFP 7x7 48L	RERMCD1621	JSCC, China
TFBGA 8x8 100L	RERMCD1309	AMKOR ATP3
UFQFPN 7x7 48L	RERMCD1622 / RERMCD1718	JSCC, China
WLCSP 81L	RERMCD1112	AMKOR ATT1

According to “RELIABILITY TESTS AND CRITERIA FOR QUALIFICATION” specification (DMS 0061692), the following qualification strategy has been defined:

- Die Qualification:
  - Cut1.0:1 full qualification lot to assess the die in LQFP100 package.
  - Cut2.0:1 full qualification lot to assess the die in LQFP100 package.
  - Cut2.1:1 subset qualification lot to assess the die in LQFP100 package.
  - Cut2.2:1 subset qualification lot to assess the die in LQFP100 package

Note: For all Cuts, ESD HBM & LU is done in LQFP128 (Max pin count)

- Package Qualification:  
The reliability test plan and result summary are presented in the following tables:

Package	Body	Pitch	Package Code	Wire	Assembly	Bonding Option	Trial
LQFP 128	14x14	0.4	TC	Gold	ATP1		1 reliability lot & Construction Analysis
LQFP 100	14x14	0.5	1L	Gold	ATP1		CDM only
LQFP80	12x12	0.5	9X	Silver/ULA	JSCC		1 reliability lot
LQFP 64	10x10	0.5	5W	Silver/ULA	JSCC		1 reliability lot
LQFP 48	7x7	0.5	5B	Silver/ULA	JSCC		CDM only
TFBGA 100L	8x8	0.8	A08Q (DY)	Gold	ATP3		1 reliability lot & Construction Analysis
UFQFN 48L	7x7	0.5	A0B9 (MI)	Silver	JSCC		1 reliability lot
WLCSP81	-	0.4	B068 (IY)	-	ATT1		1 reliability lot

### 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 validated product mission profile and reliability strategy, the qualification is granted for the STM32G47x/G48x xB/xC/xE – Die 469XXX in all packages listed in the Chapter 1.2, except for the LQFP12x12 80L.

Report will be updated when new reliability results are available

Refer to Section 3.0 for reliability test results.

## 2 PRODUCT OR TEST VEHICLE CHARACTERISTICS

### 2.1 Generalities

STM32G47x product is based on Arm® 32-bit Cortex®-M4 CPU with FPU, Adaptive real-time accelerator (ART Accelerator™) allowing 0-wait-state execution from Flash memory, frequency up to 170 MHz with 213 DMIPS, MPU, DSP instructions. There are 512 Kbytes of Flash memory with ECC support, 5 12-bits resolution ADC, 7 12-bit DAC, 7 ultra-fast comparators, 6 operational amplifiers, 17 timers, and USB Type-C power delivery controller in this product.

For additional information concerning the product behavior, refer to STM32G47x/STM32G48x datasheets.

### 2.2 Traceability

#### 2.2.1 Wafer fab information

**Table 1**

Wafer fab information	
<b>FAB1</b>	
Wafer fab name / location	TSMC Fab14 / Taiwan
Wafer diameter (inches)	12
Wafer thickness (µm)	775 +/- 25
Silicon process technology	90nm eFlash Generic TSMC
Number of masks	43
Die finishing front side (passivation) materials/thicknesses (µm)	PSG + NITRIDE, 1.75
Die area (Stepping die size) (µm)	4298.4, 4045.6
Die pad size (X,Y) (µm)	123, 59
Sawing street width (X,Y) (µm)	80, 80
Metal levels/Materials/Thicknesses (µm)	Metal 1 Cu 0.24 / Metal 2 Cu 0.31 / Metal 3 Cu 0.31 Metal 4 Cu 0.31 / Metal 5 Cu 0.31 / Metal 6 Cu 0.85 Metal 7 AlCu 1.45
Die over coating (material/thickness)	No
FIT level (Ea=0.7eV, C.L: 60%, 55°C)	3.1 FITs at qualification date
Soft Error Rate - Alpha SER [FIT/Mb] - Neutron SER [FIT/Mb] - Conditions	Alpha SER: 491 FIT/Mb Neutron SER: 445 FIT/Mb Neutron SER is an estimation at sea level of NYC (14n/h/cm <sup>2</sup> ). Alpha result is estimated using a nominal flux of 0.001α/h/cm <sup>2</sup>
Wafer Level Reliability - Electro-Migration (EM) - Time Dependent Dielectric Breakdown (TDDB) or Gate Oxide Integrity (GOI) - Hot Carrier Injection (HCI) - Negative Bias Thermal Instability (NBTI) - Stress Migration (SM)	Yes
Other Device(s) using same process	STM32L4x, STM32G4x product family, 415, 435, 461, 462, 464, 470, 468

## 2.2.2 Assembly information

**Table 2**

<b>Assembly Information</b>	
<b>Package 1 - LQFP 14x14x1.4 128L TC</b>	
Assembly plant name / location	SC AMKOR ATP1, Philippines
Pitch (mm)	0.4
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LF FOR LQ 128L PAD 5.0 SID 101385780 DR post p
Die attach material/type(glue/film)/supplier	Glue Evertech AP4200
Wire bonding material/diameter/supplier	GOLD WIRE 0.8MIL
Molding compound material/supplier/reference	Resin Sumitomo G631HQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
<b>Package 2 - LQFP 14x14x1.4 100L 1L</b>	
Assembly plant name / location	SC AMKOR ATP1, Philippine.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material/supplier/reference	LQFP14x14 100L PPF 5sq SID#101389126
Die attach material/type(glue/film)/supplier	GLUE SUMITOMO EPOXY CRM 1076YB
Wire bonding material/diameter/supplier	GOLD WIRE 0.8MIL
Molding compound material/supplier/reference	Resin Sumitomo G631HQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
<b>Package 3 - LQFP 12x12x1.4 80L 9X</b>	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LQ12 80L 208sq eff slot Etch LF JSCC
Die attach material/type(glue/film)/supplier	D/A Ablestik 3230
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	Mold Sumitomo low alpha G631SHQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3

Package 4 - LQFP 10x10x1.4 64L 5W	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LQFP64 236sq no slots STMP LF JSCC
Die attach material/type(glue/film)/supplier	D/A Ablestik 3230
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	Mold Sumitomo low alpha G631SHQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
Package 5 - LQFP 7x7x1.4 48L 5B	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	375 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LQFP48L 184sq Eff slots pur tin STMP LF JSCC
Die attach material/type(glue/film)/supplier	D/A Ablestik 3230
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	Mold Sumitomo low alpha G631SHQ
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
Package 6 - TFBGA 8x8x1.2 100L A08Q (DY)	
Assembly plant name / location	SC AMKOR ATP3, Philippines
Pitch (mm)	0.8
Die thickness after back-grinding (µm)	178 +/- 15
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	subst for TFBGA 8x8 P 0.8 SID 101406557
Die attach material/type(glue/film)/supplier	ABLEBOND GLUE 2300
Wire bonding material/diameter/supplier	WIRE GOLD DIAM. 0.8 MIL
Balls metallurgy/diameter/supplier	SOLDER BALL SAC 105 DIAM 0.35 MM
Molding compound material/supplier/reference	MOLDING COMPOUND GE100LFCS
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3



Package 7 - UFQFPN 7x7x0.55 48L A0B9 (MI)	
Assembly plant name / location	JSCC, China.
Pitch (mm)	0.5
Die thickness after back-grinding (µm)	150 +/- 25
Die sawing method	Mechanical Sawing
<b>Bill of Material elements</b>	
Lead Frame material /supplier/reference	LF FOR UQFN 7x7 48L Sn PAD 5.2 MM SQ Groove
Die attach material/type(glue/film)/supplier	Glue Hitachi EN4900GC
Wire bonding material/diameter/supplier	Ag 96.5 0.8 MIL Diam
Molding compound material/supplier/reference	RESIN SUMITOMO G770
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 3
Package 8 - WLCSP 81 B068 (IY)	
Assembly plant name / location	SC AMKOR ATT1, Taiwan.
Pitch (mm)	0.4
Die thickness after back-grinding (µm)	355 +/- 25
Die sawing method	Laser Groove
<b>Bill of Material elements</b>	
PBO material/reference	Passivation HD8820
RDL	Copper 6µm
UBM	Ti/Cu/Cu
Balls metallurgy/diameter/supplier (BGA/CSP)	Solder ball SAC405 Diam 230µm
Backside Coating material/supplier/reference	Back side coating PET film
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL 1

### 2.2.3 Reliability testing information

**Table 3**

Reliability Testing Information	
Reliability laboratory name / location	ST RSST in Rousset

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	Die Revision (Cut)	Assy Lot / Trace Code	Raw Line	Package	Note
1	9R742046 Wafer#03	1.0	7B810883	P01L*469ESXA	LQFP 14x14 100L	Die Reliability assessment.
2	9R829130 Wafer#02	2.0	7B839653	P01L*469ESXB	LQFP 14x14 100L	Die Reliability assessment.
3	9R829133 Wafer#02	2.1	7B852367	P01L*469ESXZ	LQFP 14x14 100L	Die Reliability assessment.
4	9R742046 Wafer#02	1.0	7B810882	P0TC*469ESXA	LQFP 14x14 128L	Die Reliability assessment.
5	9R829130 Wafer#05	2.0	7B841737	P0TC*469ESXB	LQFP 14x14 128L	Die Reliability assessment.
6	9R829133 Wafer#01	2.1	7B851679	P0TC*469ESXZ	LQFP 14x14 128L	Die Reliability assessment.
7	Under Definition	2.1	Under Definition	Under Definition	LQFP 12x12 80L	Package Reliability assessment.
8	9R742046 Wafer#09	1.0	GQ81024X	S05W*469ISXA	LQFP 10x10 64L	Package Reliability assessment.
9	9R742046 Wafer#09	1.0	GQ81024Y	S05B*469ISXA	LQFP 7x7 48L	Package Reliability assessment.
10	9R742046 Wafer#12	1.0	7B817A5W	P1DY*469ESXA	TFBGA 8x8 100L	Package Reliability assessment.
11	9R742046 Wafer#07	1.0	GQ81327B	S0MI*469ISXA	UFQFPN 7x7 48L	Package Reliability assessment.
12	9R742046 Wafer#11	1.0	A5811007	T0IY*469ESXA	WLCSP 81L	Package Reliability assessment.
13	9R928236 Wafer#02	2.2	7B940388	P01L*469ESXY	LQFP 14x14 100L	Die Reliability assessment.
14	9R928236 Wafer#02	2.2	7B942638	P0TC*469ESXY	LQFP 14x14 128L	Die Reliability assessment.

## 3.2 Test plan and results summary

**Table 5 - ACCELERATED LIFETIME SIMULATION TESTS**

Test code	Stress method	Stress Conditions	Lots	S.S.	Total	Results/ Lot Fail/S.S.	Comments: (N/A =Not Applicable)
HTOL	JESD22 A108	Ta=125°C Duration= 168h/1200H Vcore :1V28 Vdd : 3V6	4	77	308	Lot1: 1200h 0/77 Lot2: 1200h 0/77 Lot3: 168h 0/77 Lot13: 168h 0/77	
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500 Ω, 100 pF 2kV class2	4	3	12	Lot4: 0/3 Lot5: 0/3 Lot6: 0/3 Lot14: 0/3	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	250V	4	3	12	Lot4: 0/3 Lot5: 0/3 Lot6: 0/3 Lot14: 0/3	
Latch Up	JESD78	130°C	4	3	12	Lot4: 0/3 Lot5: 0/3 Lot6: 0/3 Lot14: 0/3	
EDR	JESD22-A117	10kcy EW @ 125°C then Storage HTB 150°C - Duration 1500h	2	77	154	Lot1: 0/77 Lot2: 0/77	
EDR	JESD22-A117	10kcy EW @ 125°C then Storage HTB 150°C - Duration 168h	1	77	77	Lot13: 0/77	
EDR	JESD22-A117	10kcy EW @ 25°C then Storage HTB 150°C - Duration 168h	3	77	231	Lot1: 0/77 Lot2: 0/77 Lot13: 168h 0/77	
EDR	JESD22-A117	10kcy EW @ -40°C then Storage HTB 150°C - Duration 168H	3	77	231	Lot1: 0/77 Lot2: 0/77 Lot13: 168h 0/77	
ELFR	JESD22-A108 JESD74	Ta=125°C Duration= 48hrs Vcore :1V28 Vdd : 3V6	2	500	1000	Lot1: 0/500 Lot2: 0/500	

**Table 6 - ACCELERATED ENVIRONMENT STRESS TESTS**

For LQFP 14x14 128L

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	1	308	308	Lot4: 0/308	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc  <input checked="" type="checkbox"/> After PC	1	77	77	Lot4: 0/77	
HTSL	JESD 22-A103	Ta=150°C, Duration= 1000hrs  <input checked="" type="checkbox"/> After PC	1	77	77	Lot4: 0/77	
UHAST	JESD 22-A118	Ta=130°C ,85% RH Duration= 96hrs  <input checked="" type="checkbox"/> After PC	1	77	77	Lot4: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6  <input checked="" type="checkbox"/> After PC	1	77	77	Lot4: 0/77	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	250V	3	3	9	Lot4: 0/3 Lot5: 0/3 Lot6: 0/3 Lot14: 0/3	

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

For LQFP 14x14 100L

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	1	3	1	Lot1: 0/3	

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

For LQFP 12x12 80L

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	1	308	308	Lot7:	Qualification in Q1-20
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc  <input checked="" type="checkbox"/> After PC	1	77	77	Lot7:	Qualification in Q1-20
HTSL	JESD 22-A103	Ta=150°C , Duration= 1000hrs  <input checked="" type="checkbox"/> After PC	1	77	77	Lot7:	Qualification in Q1-20
UHAST	JESD 22-A118	Ta=130°C ,85% RH Duration= 96hrs  <input checked="" type="checkbox"/> After PC	1	77	77	Lot7:	Qualification in Q1-20
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6  <input checked="" type="checkbox"/> After PC	1	77	77	Lot7:	Qualification in Q1-20
ESD CDM	ANSI/ESDA/ JEDEC JS-002		1	3	3	Lot7:	Qualification in Q1-20

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

**For LQFP 10x10 64L**

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	1	308	308	Lot8: 0/308	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc <input checked="" type="checkbox"/> After PC	1	77	77	Lot8: 0/77	
HTSL	JESD 22-A103	Ta=150°C, Duration= 1000hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot8: 0/77	
UHAST	JESD 22-A118	Ta=130°C ,85% RH Duration= 96hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot8: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 <input checked="" type="checkbox"/> After PC	1	77	77	Lot8: 0/77	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	500V	1	3	3	Lot8: 0/3	

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

**For LQFP 7x7 48L**

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	500V	1	3	3	Lot9: 0/3	

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

For TFBGA 8x8 100L

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	1	231	231	Lot10: 0/231	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc <input checked="" type="checkbox"/> After PC	1	77	77	Lot10: 0/77	
HTSL	JESD 22-A103	Ta=150°C, Duration= 1000hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot10: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 <input checked="" type="checkbox"/> After PC	1	77	77	Lot10: 0/77	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	500V	1	3	3	Lot10: 0/3	

For UFQFPN 7x7 48L

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	1	308	308	Lot11: 0/308	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc <input checked="" type="checkbox"/> After PC	1	77	77	Lot11: 0/77	
HTSL	JESD 22-A103	Ta=150°C, Duration= 1000hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot11: 0/77	
UHAST	JESD 22-A118	Ta=130°C ,85% RH Duration= 96hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot11: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 <input checked="" type="checkbox"/> After PC	1	77	77	Lot11: 0/77	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	500V	1	3	3	Lot11: 0/3	

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



**For WLCSP 81**

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, MSL1 (168h@85C/85%RH) 3x Reflow simulation Peak Reflow Temp= 260°C	1	308	308	Lot12: 0/308	
TC	JESD22-A104	Ta=-65/150°C Duration= 500cyc <input checked="" type="checkbox"/> After PC	1	77	77	Lot12: 0/77	
HTSL	JESD 22-A103	Ta=150°C, Duration= 1000hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot12: 0/77	
UHAST	JESD 22-A118	Ta=130°C ,85% RH Duration= 96hrs <input checked="" type="checkbox"/> After PC	1	77	77	Lot12: 0/77	
THB	JESD 22-A101	Ta=85°C/85%RH VDD=3v6 <input checked="" type="checkbox"/> After PC	1	77	77	Lot12: 0/77	
ESD CDM	ANSI/ESDA/ JEDEC JS-002	500V	1	3	3	Lot12: 0/3	

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

**Table 8 - PACKAGE ASSEMBLY INTEGRITY TESTS**
**For LQFP 14x14 128L**

Test code	Method	Tests 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 -Solderability	JESD 22B102 JESDB100/ B108	1	50	50	Lot4: 0/50	

**For TFBGA 8x8 100L**

Test code	Method	Tests 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 -Solderability	JESD 22B102 JESDB100/ B108	1	50	50	Lot10: 0/50	

## 4 APPLICABLE AND REFERENCE DOCUMENTS

Reference	Short description
JESD47	Stress-Test-Driven Qualification of Integrated Circuits
SOP2.4.4	Record Management Procedure
SOP2.6.2	Internal Change Management
SOP2.6.7	Finished Good Maturity Management
SOP2.6.9	Package & Process Maturity Management in BE
SOP2.6.11	Program Management for Product Development
SOP2.6.17	Management of Manufacturing Transfers
SOP2.6.19	Front-End Technology Platform Development and Qualification
DMS 0061692	Reliability Tests and Criteria for Product Qualification
ANSI/ESDA JEDEC JS-001	Electrostatic discharge (ESD) sensitivity testing human body model (HBM)
ANSI/ESDA JEDEC JS-002	Electrostatic discharge (ESD) sensitivity testing charge device model (CDM)
JESD78	IC Latch-up test
JESD 22-A108	Temperature, Bias and Operating Life
JESD 22-A103	High Temperature Storage Life
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-A104:	Temperature cycling
JESD22-A110:	Temperature Humidity Bake
JESD 22B102:	Solderability test
JESD22B100/B108:	Physical dimension

## 5 GLOSSARY

Reference	Short description
HTOL	High Temperature Operating Life
EDR	Endurance and Data Retention
ELFR	Early Failure Rate
PC	Preconditioning (solder simulation)
THB	Temperature Humidity Bias
TC	Temperature cycling
uHAST	Unbiased Highly Accelerated Stress Test
HAST	Highly Accelerated Stress Test
HTSL	High temperature storage life
DMS	ST Advanced Documentation Controlled system/ Documentation Management system
ESD HBM	Electrostatic discharge (human body model)
ESD CDM	Electrostatic discharge (charge device model)
LU	Latch-up
CA	Construction Analysis

## 6 REVISION HISTORY

Revision	Author	Content description	Approval List			
			Function	Location	Name	Date
1.0	Pascal CARDOSI	Initial Release	Div. Quality Manager	Rousset	Pascal NARCHE	01 <sup>st</sup> -Mar-2019
			Q&R Quality Manager	Rousset	Frederic BRAVARD	01 <sup>st</sup> -Mar-2019
2.0	Pascal CARDOSI	Add all Commercial Products linked to die 469 Maturity update: 30	Q&R Quality Manager	Rousset	Frederic BRAVARD	29 <sup>th</sup> -Jul-2019
2.1	Pascal CARDOSI	Update with results for cut2.2 qualification - PN11871	Q&R Quality Manager	Grenoble	Dominique GALIANO	06 <sup>th</sup> -Dec-2019

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