

PRODUCT / PROCESS CHANGE NOTIFICATION

1. PCN basic data

1.1 Company		STMicroelectronics International N.V
1.2 PCN No.	MDG/21/12791	
1.3 Title of PCN	STM32F209 1Mb product improvement – on listed products	
1.4 Product Category	STM32F205x, STM32F207x, STMF215x, STM32F217x listed products	
1.5 Issue date	2021-07-16	

2. PCN Team

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2.2 Change responsibility	
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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
General Product & Design	Die redesign: Mask or mask set change with new die design - Design changes in active elements.	TSMC Fab14 (Taiwan)/ Crolles(France)

4. Description of change

	Old	New
4.1 Description	Current die revision: - STM32F209 1MB rev2 (Cut 2.4) in ST Crolles CRL300 (France) - STM32F209 1MB rev3 (Cut 2.5) in TSMC Fab14 (Taiwan) Current RM0033 Rev 8 - Reference Manual STM32F205xx, STM32F207xx, STM32F215xx and STM32F217xx advanced Arm-based 32-bit MCUs	New die revision to improve manufacturing efficiency: - STM32F209 1MB rev5 (Cut 2.6) in ST Crolles CRL300 (France) - STM32F209 1MB rev4 (Cut 2.6) in TSMC Fab14 (Taiwan) New RM0033 Rev 9 - Reference Manual - february 2021 STM32F205xx, STM32F207xx, STM32F215xx and STM32F217xx advanced Arm-based 32-bit MCUs
4.2 Anticipated Impact on form,fit, function, quality, reliability or processability?	No impact on Form, Fit or Function	

5. Reason / motivation for change

5.1 Motivation	Product will be improved by adjusting some active cells. Dice revisions of the products will change. There is no change in the product logic and therefore no change to product functionality.
5.2 Customer Benefit	SERVICE IMPROVEMENT

6. Marking of parts / traceability of change

6.1 Description	based on ST internal tools
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7. Timing / schedule

7.1 Date of qualification results	2021-05-14
7.2 Intended start of delivery	2021-12-20
7.3 Qualification sample available?	Upon Request

8. Qualification / Validation			
8.1 Description	12791 Binder for RER1715 V14.1 - RER1302 V6.1.pdf		
8.2 Qualification report and qualification results	Available (see attachment)	Issue Date	2021-07-16

9. Attachments (additional documentations)			
12791 Public product.pdf 12791 Binder for RER1715 V14.1 - RER1302 V6.1.pdf 12791 PCN12791_ Additional information.pdf			

10. Affected parts		
10. 1 Current		10.2 New (if applicable)
10.1.1 Customer Part No	10.1.2 Supplier Part No	10.1.2 Supplier Part No
	STM32F205RBT6	
	STM32F205RBT6TR	
	STM32F205RBT7	
	STM32F205RCT6	
	STM32F205RCT6TR	
	STM32F205RCT7	
	STM32F205RET6	
	STM32F205RET6TR	
	STM32F205RET7	
	STM32F205REY6TR	
	STM32F205RFT6	
	STM32F205RFT6TR	
	STM32F205RGT6	
	STM32F205RGT6TR	
	STM32F205RGT6W	
	STM32F205RGT7	
	STM32F205RGY6TR	
	STM32F205VBT6	
	STM32F205VCT6	
	STM32F205VCT6TR	
	STM32F205VCT7	
	STM32F205VET6	
	STM32F205VET6TR	
	STM32F205VET7	
	STM32F205VET7TR	
	STM32F205VFT6	
	STM32F205VFT6TR	
	STM32F205VGT6	
	STM32F205VGT6TR	
	STM32F205VGT6V	
	STM32F205VGT6W	
	STM32F205VGT7	
	STM32F205ZCT6	
	STM32F205ZCT7	
	STM32F205ZCT7TR	
	STM32F205ZET6	
	STM32F205ZET6TR	
	STM32F205ZET7	
	STM32F205ZET7TR	

	STM32F205ZFT6	
	STM32F205ZGT6	
	STM32F205ZGT6TR	
	STM32F205ZGT7	
	STM32F207ICH6	
	STM32F207ICT6	
	STM32F207IEH6	
	STM32F207IET6	
	STM32F207IFT6	
	STM32F207IGH6	
	STM32F207IGH7	
	STM32F207IGT6	
	STM32F207IGT7	
	STM32F207VCT6	
	STM32F207VCT6TR	
	STM32F207VCT7	
	STM32F207VET6	
	STM32F207VET6TR	
	STM32F207VGT6	
	STM32F207VGT6TR	
	STM32F207VGT7	
	STM32F207ZCT6	
	STM32F207ZCT7	
	STM32F207ZET6	
	STM32F207ZET6TR	
	STM32F207ZFT6	
	STM32F207ZGT6	
	STM32F207ZGT6TR	
	STM32F207ZGT7	
	STM32F215RET6	
	STM32F215RGT6	
	STM32F215VET6	
	STM32F215VGT6	
	STM32F215VGT7	
	STM32F215ZET6	
	STM32F215ZGT6	
	STM32F215ZGT7TR	
	STM32F217IEH6	
	STM32F217IET6	
	STM32F217IGH6	
	STM32F217IGT6	
	STM32F217IGT7	
	STM32F217VET6	
	STM32F217VET6TR	
	STM32F217VGT6	
	STM32F217VGT6TR	
	STM32F217ZET6	
	STM32F217ZGT6	

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This document includes 2x Reliability Evaluation Reports

- Page 2: RER1715 Revision 14.1
- Page 38 : RER1302 Revision 6.1

MDG-MCD-RER1715

RELIABILITY REPORT

TSMC Taiwan Fab14 additional source for STM32 products in M10/90nm technology

**PCN10333 – PCN10595 – PCN10596 – PCN10544 –
PCN10671 – PCN10703 – PCN10816 – PCN12791-
PCN12792**

Qualification Type: Product & Package Evaluation

Product information	
Commercial product	STM32F405/407/415/417 STM32F205/207/215/217 STM32F427/429/437/439 STM32F401xB/C STM32F410 STM32F411 STM32F401xD/E STM32F412 STM32F413/423 STM32F745/746/750/756 STM32F446 STM32F469/479 STM32F765/767/769/777/779 STM32F722/723/730/732/733
Product line	413X66 - 411X66 - 419X66 - 423X66 - 458X66 - 431X66 - 433X66 441X66 - 463X66 - 449X66 - 421X66 - 434X66 - 451X66 - 452X66
Product description	STM32F2x - STM32F4x - STM32F7x Families
Finish Good Code	ES32F407IGH6\$P8 (UFBGA176) / ES32F207IEH6\$PB (UFBGA176) ES32F429NIH6\$P9 (TFBGA216) / ES32F401VCT6\$PC (LQFP100L) IS32F410RBT6\$S3 (LQFP64L) / ES32F411VET6\$P2 (LQFP100L) ES32F401VET6\$P3 (LQFP100L) / ES32F412ZEJ6\$P5 (UFBGA144) ES32F413ZGJ6\$P2 (UFBGA144) / ES32F746NGH6\$P3 (TFBGA216) ES32F446ZCH6\$P2 (UFBGA144) / ES32F469NGH6\$P2 (TFBGA216) 32F769NIH6\$P4 (TFBGA216) / ES32F723IEK6\$P2 (UFBGA176) 32F429NIH6\$U9 (TFBGA216)
Production Mask Set revision	413XXX5 (Cut 1.4) / 411XXX4 (Cut 2.6) 419XXX5 (Cut 2.2) / 423XXX1 (Cut 1.1) 458XXX1 (Cut 1.0) / 431XXX1 (Cut 1.0) 433XXX1 (Cut 1.1) / 441XXX1 (Cut 3.0) 463XXX1 (Cut 1.0) / 449 XXX1 (Cut 1.1) 421XXX1 (Cut 1.0) / 434XXX1 (Cut 1.0) 451XXX1 (Cut 1.1) / 452XXX1 (Cut 1.0)
Product Division	Microcontrollers Division (MCD)
Silicon process technology	CMOSM10/90nm
Wafer fabrication location	TSMC TAIWAN Fab14

Reliability Evaluation assessment: PASS

Approval List Document revision 1.0			
Function	Site	Name	Date
Div Q&R Responsible	Rousset	Frederic BRAVARD	March 2 nd , 2018
Div Quality Manager	Rousset	Pascal NARCHE	March 2 nd , 2018
Approval List Document revision 2.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	March 9 th , 2018
Approval List Document revision 3.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	April 18 th , 2018
Approval List Document revision 4.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	July 04 th , 2018
Approval List Document revision 5.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	July 13 th , 2018
Approval List Document revision 6.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	July 17 th , 2018
Approval List Document revision 7.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	August 10 th , 2018
Approval List Document revision 8.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	November 09 th , 2018
Approval List Document revision 9.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	December 03 rd , 2018
Approval List Document revision 10.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	January 04 th , 2019
Approval List Document revision 11.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	February 05 th , 2019
Approval List Document revision 12.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	February 19 th , 2019
Approval List Document revision 13.0			
Div Q&R Responsible	Rousset	Frederic BRAVARD	October 07 th , 2019
Approval List Document revision 14.0 &14.1			
Div Q&R Responsible	Grenoble	Dominique Galiano	February 1 st , 2021 May 14 th , 2021

Contents

1	RELIABILITY EVALUATION OVERVIEW.....	4
1.1	Objectives	4
1.2	Conclusion	4
2	RELIABILITY DEVICE CHARACTERISTICS	5
2.1	Reliability Device description	5
2.2	Reliability Device Traceability	5
2.2.1	Realibility information.....	9
2.2.2	Front-End Information	9
2.2.3	Back-End Information	10
3	RELIABILITY EVALUATION PLAN / RESULTS SUMMARY	13
3.1	Reliability evaluation : strategy & results summary	13
3.1.1	Die related tests:	15
3.1.2	Packages related tests:.....	30
4	APPLICABLE AND REFERENCE DOCUMENTS	35
5	GLOSSARY	35
6	REVISION HISTORY	35

1 RELIABILITY EVALUATION OVERVIEW

1.1 Objectives

The aim of this report is to present the results of reliability evaluation performed for the following products diffused in TSMC Fab14 (CMOS M10/90nm) and assembled in the listed packages:

Products	Dice	Package
STM32F405/407/415/417	413XXX5	UFBGA176 10*10 ATP3 UFBGA144 10*10 ATP3 UFBGA144 7*7 ATP3 UFBGA169 7*7 ATP3 TFBGA100 8*8 ATP3 TFBGA216 13*13 ATP3 TFBGA216 13*13 MUAR LQFP64 10*10 ATP1 LQFP64 10*10 JSCC LQFP144 20*20 ATP1 LQFP100 14*14 ATP1 LQFP176 24*24 ASE LQFP208 28*28 ATP1 WLCSP143 ATT1 WLCSP90 ATT1 WLCSP36 ATT1 WLCSP49 ATT1 UQFN48 7*7 JSCC
STM32F205/207/215/217	411XXX4	
STM32F427/429/437/439	419XXX5	
STM32F410	458XXX1	
STM32F401	423XXX1	
STM32F411	431XXX1	
STM32F401	433XXX1	
STM32F412	441XXX1	
STM32F413/423	463XXX1	
STM32F745/746/750/756	449XXX1	
STM32F446	421XXX1	
STM32F469/479	434XXX1	
STM32F765/767/769/777/779	451XXX1	
STM32F722/723/730/732/733	452XXX1	

1.2 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 test results, the qualification is granted for all FGs diffused in TSMC Fab14 (CMOS M10/90nm) 12" – and listed for the dice and packages described in Chapter 1.1

Refer to Chapter 3.1 Reliability evaluation: Results Summary for details on reliability test results.

This report has been updated with reliability results of 411XXX4 (Cut 2.6) linked to PCN12791 and 413XXX5 (Cut 1.4) linked to PCN 12792 (Flash GO1 band gap design Fix)

2 RELIABILITY DEVICE CHARACTERISTICS

2.1 Reliability Device description

The STM32Fx - die 413XXX5 - die 411XXX4 - die 419XXX5 - die 421XXX1 - die 423XXX1 - die 458XXX1 - die 431XXX1 - die 433XXX1 - die 441XXX1 - die 463XXX1 - die 449XXX1 - die 434XXX1 - die 451XXX1 - die 452XXX1 are processed in CMOS10/90nm, diffused in TSMC Fab14 12" (Taiwan)

For additional information concerning the product behaviours, refer to their STM32Fx datasheets.

2.2 Reliability Device Traceability

2.2.1 Reliability information

2.2.1.1 Devices used for die and package evaluation:

RER Lot ID	Lot 1,2,3 Die reliability	Lot 8 Die reliability	Lot 9 Die reliability	Lot 10,11,12 Die reliability
Finish Good	ES32F407IGH6\$P7	ES32F207IEH6\$PA	ES32F429NIH6\$P9	IS32F410RBT6\$S3
Die Name / Cut	413 / Cut1.3	411 / Cut2.5	419 / Cut2.2	458 / Cut 1.0
Laboratory location	ST Grenoble	ST Grenoble	ST Grenoble	ST Grenoble
Fab name location	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"
EWS name location	ST Rousset	ST Rousset	ST Rousset	ST Rousset
Assembly plant location	AMKOR ATP3	AMKOR ATP3	AMKOR ATP3	STATSChipPAC JSCC
FT name location	GRENOBLE	GRENOBLE	AMKOR ATP3	STATSChipPAC JSCC
Package description	UFBGA176 P0.65 10X10X0.6	UFBGA176 P0.65 10X10X0.6	TFBGA216 P0.8 13x13x1.2	LQFP64L 10x10x1.4

RER Lot ID	Lot 13 Die reliability	Lot 14 Die reliability	Lot 18 Die reliability	Lot 19 Die reliability
Finish Good	ES32F401VCT6\$PC	ES32F411VET6\$P2	32F401VET6\$P3	ES32F412ZEJ6\$P5
Die Name / Cut	423 / Cut 1.1	431 / Cut 1.0	433 / Cut1.1	441 / Cut 3.0
Laboratory location	ST Grenoble	ST Grenoble	ST Grenoble	ST Grenoble
Fab name location	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"
EWS name location	ARDENTEC TAIWAN	ARDENTEC TAIWAN	ARDENTEC TAIWAN	ARDENTEC TAIWAN
Assembly plant location	AMKOR ATP1	AMKOR ATP1	AMKOR ATP1	AMKOR ATP3
FT name location	AMKOR ATP3	AMKOR ATP3	AMKOR ATP3	AMKOR ATP3
Package description	LQFP100L 14x14x1.4	LQFP100L 14x14x1.4	LQFP100L 14X14x1.4	UFBGA144 P0.8 10x10x0.6

RER Lot ID	Lot 20 Die reliability	Lot 21 Die reliability	Lot 26 Die reliability
Finish Good	ES32F413ZGJ6\$P2	ES32F746NGH6\$P3	ES32F446ZCH6\$P2
Die Name / Cut	463 / Cut1.0	449 / Cut 1.1	421 / Cut 1.0
Laboratory location	ST Grenoble	ST Grenoble	ST Grenoble
Fab name location	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"
EWS name location	ARDENTEC TAIWAN	ARDENTEC TAIWAN	ARDENTEC TAIWAN
Assembly plant location	AMKOR ATP3	AMKOR ATP3	AMKOR ATP3
FT name location	AMKOR ATP3	AMKOR ATP3	AMKOR ATP3
Package description	UFBGA144 P0.8 10x10x0.6	TFBGA216 P0.8 13x13x1.2	UFBGA144 P0.5 7x7x0.6

RER Lot ID	Lot 28 Die reliability	Lot 29 Die reliability	Lot 30 Die reliability
Finish Good	ES32F469NGH6\$P2	32F769NIH6\$P4	ES32F723IEK6\$P2
Die Name / Cut	434 / Cut 1.0	451 / Cut 1.1	452 / Cut 1.0
Laboratory location	ST Grenoble	ST Grenoble	ST Grenoble
Fab name location	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"
EWS name location	ARDENTEC TAIWAN	ARDENTEC TAIWAN	ARDENTEC TAIWAN
Assembly plant location	AMKOR ATP3	AMKOR ATP3	AMKOR ATP3
FT name location	AMKOR ATP3	AMKOR ATP3	AMKOR ATP3
Package description	TFBGA216 P0.8 13x13x1.2	TFBGA216 P0.8 13x13x1.2	UFBGA176 P0.65 10X10X0.6

RER Lot ID	Lot 31 Die reliability	Lot 32 Die reliability
Finish Good	ES32F407IGH6\$P8	ES32F207IEH6\$PB
Die Name / Cut	413 / Cut 1.4	411 / Cut 2.6
Laboratory location	ST Grenoble	ST Grenoble
Fab name location	TSMC Fab 14 12"	TSMC Fab 14 12"
EWS name location	ARDENTEC TAIWAN	ARDENTEC TAIWAN
Assembly plant location	AMKOR ATP3	AMKOR ATP3
FT name location	AMKOR ATP3	AMKOR ATP3
Package description	UFBGA176 P0.65 10X10X0.6	UFBGA176 P0.65 10X10X0.6

2.2.1.2 Devices used for package evaluation:

RER Lot ID	Lot 1,2,3 Package reliability	Lot 4 Package reliability	Lot 5 Package Reliability	Lot 6 Package Reliability
Finish Good	ES32F407IGH6 \$P7	IS32F405RGT6 \$S6	ES32F405RGT6 \$P6	ES32F405ZGT6 \$P6
Die Name / Cut	413 / Cut1.3	413 / Cut1.3	413 / Cut1.3	413 / Cut1.3
Laboratory location	ST Grenoble	ST Rousset	ST Rousset	ST Rousset
Fab name location	TSMC Fab 14 12"	TSMC Fab14 12"	TSMC Fab14 12"	TSMC Fab14 12"
EWS name location	ST Rousset	ST Rousset	ST Rousset	ST Rousset
Assembly plant location	AMKOR ATP3	JSCC	AMKOR ATP1	AMKOR ATP1
Package description	UFBGA176 P0.65 10x10x0.6	LQFP64 10x10x1.4	LQFP64 10x10x1.4	LQFP144 20x20x1.4

RER Lot ID	Lot 7 Package reliability	Lot 9 Package reliability	Lot 15 Package reliability	Lot 16 Package reliability	Lot 17 Package reliability
Finish Good	ES32F417IGT6 \$Y6	ES32F429NIH6 \$P9	ES32F429ZIY6 \$T9	ES32F405OGY6 \$T7	ES32F429BIT6 \$P9
Die Name / Cut	413 / Cut1.3	419 / Cut2.2	419 / Cut2.0	413 / Cut1.3	419 / Cut2.2
Laboratory location	ST Rousset	ST Grenoble	ST Grenoble	ST Grenoble	ST Rousset
Fab name location	TSMC Fab14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"
EWS name location	ST Rousset	ST Rousset	ST Rousset	ST Rousset	ST Rousset
Assembly plant location	ASE	AMKOR ATP3	AMKOR ATT1	AMKOR ATT1	AMKOR ATP1
Package description	LQFP176 24x24x1.4	TFBGA216 P0.8 13x13x1.2	WLCSP143	WLCSP90	LQFP208 28x28x1.4

RER Lot ID	Lot 22 Package reliability	Lot 23 Package reliability	Lot 24 Package reliability	Lot 25 Package reliability	Lot 27 Package reliability	Lot 31 Package reliability
Finish Good	32F410CBU6 \$S3	ES32F410TBY6 \$T3	32F411VET6 \$P2	ES32F745VGH6 \$P3	32F411CEY6TR \$T2	32F429NIH6 \$U9
Die Name / Cut	458/ Cut1.0	458/ Cut1.0	431/ Cut 1.0	449/ Cut 1.1	431/ Cut 1.0	419 / Cut2.2
Laboratory location	ST Rousset	ST Grenoble	ST Grenoble	ST Grenoble	ST Grenoble	ST Grenoble
Fab name location	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"	TSMC Fab 14 12"
EWS name location	ST Rousset	ST Rousset	ST Rousset	ST Rousset	ST Rousset	ST Rousset
Assembly plant location	JSCC	AMKOR ATT1	AMKOR ATP1	AMKOR ATP3	AMKOR ATT1	MUAR MU1A
Package description	UQFN48 7X7	WLCSP36	LQFP100 14X14	TFBGA100 8X8	WLCSP49	TFBGA216 P0.8 13x13x1.2

Comment: ST is certified ISO/TS 16949. This induces certification for all internal and subcontractor plants
ST certification document can be downloaded under the following link:

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



2.2.2 Front-End Information

Front-End	Diffusion FAB
Die	413, 411, 419, 421, 423, 458, 431, 433, 441, 463, 449, 434, 451, 452
Wafer Fab Name	TSMC Fab14
Wafer Fab Location/ Address	Taiwan Semiconductor Manufacturing Company, Ltd. No. 1-1, Nan-Ke North Rd., Southern Taiwan Science Park 741-44 Tainan, Taiwan
Process Technology Name	CMOSM10 90nm
Wafer Diameter	12 inches
Wafer Thickness	775+/-25 μ m
Die Size	Die 413 : 4004 x 4258 μ m / Die 411 : 4006 x 3674 μ m / Die 419 : 5582 x 4556 μ m Die 423 : 3000 x 3000 μ m / Die 458 : 2614 x 2588 μ m / Die 431 : 3034 x 3220 μ m Die 433 : 3064 x 3064 μ m / Die 441 : 3686 x 3658 μ m / Die 463 : 4074 x 3986 μ m Die 449 : 5884 x 4574 μ m / Die 421 : 3850 x 3728 μ m / Die 434 : 5730 x 4928 μ m Die 451 : 6130 x 5572 μ m / Die 452 : 4810 x 4376 μ m
Scribe Line size x/y	80 x80 μ m
Pad die Size / Pad type :	63x73 μ m & 59x123 μ m
Layer Under Metallization - Material - Thickness	50 nm Nitride + 580 nm Oxide
Metal Layers - Number - Materials - Thickness	Metal 1 TaN/Ta/CuSeed/Cu 0.220 μ m Metal 2 TaN/Ta/CuSeed/Cu 0.280 μ m Metal 3 TaN/Ta/CuSeed/Cu 0.280 μ m Metal 4 TaN/Ta/CuSeed/Cu 0.280 μ m Metal 5 TaN/Ta/CuSeed/Cu 0.280 μ m Metal 6 Ta/TaN/AlCu 0.730 μ m Metal 7 AlCu 1.200 μ m
Passivation Layers - Number - Materials - Thickness	USG + NITRIDE
Back Metal Finishing - Thickness	RAW SILICON
Die overcoat: - Material - Thickness	No
Other Device using same process	STM32F2x, STM32F4x, STM32F7x, STM32F42x / STM32F43x, STM32F410x, STM32F401x, STM32F411x, STM32F401x, STM32F412x, STM32F413x, STM32F423x, STM32F446x, STM32F469x, STM32F479x, STM32F767x, STM32F769x, STM32F777x, STM32F779x, STM32F722x, STM32F723x, STM32F730x, STM32F732x, STM32F733x
FIT Level (Ea=0.7eV, C.L: 60%, 55°C)	FIT = 5.6 at qualification date
Soft Error Rate - Alpha SER [FIT/Mb] - Neutron SER [FIT/Mb] - Conditions	STM32F2x: Alpha SER: 419 Fit/Mb conditions: 0.001 α /cm ² /h Temp: 125°C Neutron SER: 410 Fit/Mb conditions: 13n/cm ² /h (>400Mev) Temp: 125°C STM32F4x & STM32F7x: Alpha SER: 525 Fit/Mb conditions: 0.001 α /cm ² /h Temp: 125°C Neutron SER: 1195 Fit/Mb conditions: 13n/cm ² /h (>400Mev) Temp: 125°C
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 Yes Yes Yes Yes Yes

2.2.3 Back-End Information

Package Description	Package UFBGA176 P0.65 10x10	Package LQFP64 10x10	Package LQFP64 10x10	Package LQFP100 14x14	Package LQFP144 20x20
Assembly Plant Name	AMKOR ATP3	STATSChipPAC China (JSCC)	AMKOR ATP1		
Assembly Plant Location/ Address	119 North Science Avenue Special Economic Processing Zone, Binan Laguna, 4024, Philippines	188 Hua Xu Road, Xujing County, Qingpu District 201702 Shanghai, China	Special economic Zone KM22 East service road, South Superhighway,Cupang Muntinlupa City, 1702 Philippines		
Die Thickness after Back grinding	75 µm +/- 12	375 µm +/- 25µm	290 µm +/- 25µm	375 µm +/- 25µm	290 µm +/- 25µm
Die sawing method	Step cut	Step cut	Step cut	Step cut	Step cut
Die attach material - Supplier / refer - Type (Glue/Film)	DAF Ablestik ATB130U	ABLESTICK3 3230	EVERTECH AP4200 GLUE	SUMITOMO EPOXY CRM 1076YB	SUMITOMO EPOXY CRM 1076YB
Wire bonding - Type / diameter	Gold wire 0.8 mils	Ag 96.5 0.8 mils	Gold wire 0.8 mils	Gold wire 0.8 mils	Gold wire 0.8 mils
Lead Frame or substrate Material	UFBGA 10X10 176L+25 P0.5 DS7409HGB	LQFP10x10 64L	LQFP 10x10 64L	LQFP14x14 100L	LQFP20x20 144L
Lead Platings - Natures - Thickness	NA	PURE Tin Thickness : tolerance 7 to 20 µm	PURE Tin Thickness : tolerance 7 to 20 µm	Nickel : 0.4 µm min to 1.5 µm max Palladium : 0.02 µm min to 0.15 µm max Gold : 0.003 µm min to 0.02 µm max	
Balls Material & Diameter (BGA & CSP)	SOLDER BALLS WITH 200µ DIAM SN96.5 AG3.5%	NA	NA	NA	NA
Routing Layer Material (CSP)	NA	NA	NA	NA	NA
PBO passivation (CSP)	NA	NA	NA	NA	NA
Back side coating (CSP) - Material	NA	NA	NA	NA	NA
Molding Compound / Resin encapsulation - Type - Supplier / refer.	GE100LFCS	Low alpha G631SHQ SUMITOMO	G631HQ SUMITOMO	G631HQ SUMITOMO	G631HQ SUMITOMO
Package Moisture Sensitivity Level (JEDEC J-STD020D)	3	3	3	3	3



MDG-MCD Reliability Evaluation Report

Package Description	Package LQFP176 24x24	Package LQFP208 28x28	Package TFBGA216 P0.8 13x13	Package UFBGA144 P0.8 10x10	Package TFBGA100 P0.8 8x8
Assembly Plant Name	ASE (TAIWAN)	AMKOR ATP1	AMKOR ATP3		
Assembly Plant Location/ Address	550, Chung-Hwa Road Section 1, Chung-Li District, Taoyuan City, 32016 Taiwan	Special economic Zone KM22 East service road, South Superhighway, Cupang Muntinlupa City, 1702 Philippines	119 North Science Avenue Special Economic Processing Zone, Binan Laguna, 4024, Philippines		
Die Thickness after Back grinding	300 μm +/- 25 μm	290 μm +/- 25	180 μm +/- 25	75 μm +/- 12	180 μm +/- 25
Die sawing method	Step cut	Step cut	Step cut	Step cut	Step cut
Die attach material - Supplier / refer - Type (Glue/Film)	YIZTECH 8143 ASE ASE TAIWAN	Evertch AP4200	ABLEBOND GLUE 2300	DAF Ablestik ATB130U	ABLEBOND GLUE 2300
Wire bonding - Type / diameter	Gold wire 0.8 mils	Gold wire 0.8 mils	Gold wire 0.8 mils	Gold wire 0.8 mils	Gold wire 0.8 mils
Lead Frame or substrate Material	LQFP 176L 5.84 SQ Copper C7025	LQ 208L PAD6.8SQ DR C194	TFBGA13X13 216	UFBGA 10X10 144L P0.8 SID 101389269	TFBGA 8x8 P 0.8 SID 101395402
Lead Platings - Natures - Thickness	PURE Tin Thickness : tolerance 7 to 20 μm	PURE Tin Thickness : tolerance 7 to 20 μm	NA	NA	NA
Balls Material & Diameter (BGA & CSP)	NA	NA	SAC 105 DIAM 0.35 mm	SOLDER BALLS WITH 250 μ DIAM SN96.5 AG3.5%	SAC 105 DIAM 0.35 mm
Routing Layer Material (CSP)	NA	NA	NA	NA	NA
PBO passivation (CSP)	NA	NA	NA	NA	NA
Back side coating (CSP) - Material	NA	NA	NA	NA	NA
Molding Compound / Resin encapsulation - Type - Supplier / refer.	SUMITOMO EME-G631H	SUMITOMO G631HQ	HITACHI GE100LFCS	HITACHI GE100LFCS	HITACHI GE100LFCS
Package Moisture Sensitivity Level (JEDEC J-STD020D)	3	3	3	3	3



MDG-MCD Reliability Evaluation Report

Package Description	Package UFBGA144 P0.5 7x7	Package TFBGA216 P0.8 13x13	Package QFN48 7X7	Package WLCSP36	Package WLCSP49	Package WLCSP 143	Package WLCSP 90
Assembly Plant Name	AMKOR ATP3	MUAR MU1A	STATSChipPAC China (JSCC)	AMKOR ATT1			
Assembly Plant Location/ Address	119 North Science Avenue Special Economic Processing Zone, Binan Laguna, 4024, Philippines	Tanjong Agas, Industrial Area, 84007 Muar, Johor, Malaysia	188 Hua Xu Road, Xujing County, Qingpu District 201702 Shanghai, China	1F, No. 1, Kao-Ping Sec, Chung-Feng Rd Lungtan Township, Taoyuan County,325 Taiwan			
Die Thickness after Back grinding	75 µm +/- 12	235 µm +/- 25	150 µm +/- 25	355 µm +/- 25	355 µm +/- 25	355 µm +/- 25	355 µm +/- 25
Die sawing method	Step cut	Step cut	Step cut	Step cut	Step cut	Step cut	Step cut
Die attach material - Supplier / refer - Type (Glue/Film)	ABLESTIK ATB130U	ABLESTIK 2100A	ABLEBOND GLUE 8290	NA	NA	NA	na
Wire bonding - Type / diameter	Gold wire 0.8 mils	Gold wire 0.8 mils	Ag wire 0.8 mils	NA	NA	NA	na
Lead Frame or substrate Material	UFBGA 7X7 144L	TFBGA 13x13 216L	UQFN 7X7 48L Sn	NA	NA	NA	na
Lead Platings - Natures - Thickness	NA	NA	Sn : 98-100% Thickness : tolerance 7 to 20 µm	NA	NA	NA	na
Balls Material & Diameter (BGA & CSP)	SN96.5 AG3.5% Diam 200µm	SACN306 Diam 350µm	NA	SACN125 Diam 230µm	SACN125 Diam 230µm	SACN125 Diam 230µm	SACN125 Diam 250µm
Routing Layer Material (CSP)	NA	NA	NA	RDL Cu	RDL Cu	RDL Cu	RDL Cu
PBO passivation (CSP)	NA	NA	NA	PBO HD 8820	PBO HD 8820	PBO HD 8820	PBO HD 8820
Back side coating (CSP) - Material	NA	NA	NA	PET film Lintec LC2850	PET film Lintec LC2850	PET film Lintec LC2850	PET film Lintec LC2850
Molding Compound / Resin encapsulation - Type - Supplier / refer.	HITACHI GE100LFCS	HITACHI GE100LF1-2	SUMITOMO G770	NA	NA	NA	NA
Package Moisture Sensitivity Level (JEDEC J-STD020D)	3	3	3	1	1	1	1

3 RELIABILITY EVALUATION PLAN / RESULTS SUMMARY

3.1 Reliability evaluation : strategy & results summary

The STM32Fx - dice 411, 413, 419, 421, 423, 458, 431, 433, 441, 449, 463, 434, 451, 452 - are 32 bits microcontrollers.

These products are already qualified in ST Rousset R8" and/or in ST Crolles C300mm.

Product	Die	Qualification Report	Plant
STM32F405/407/415/417	413	RERMCD1030 RERMCD1409	ST Rousset R8 ST Crolles C300
STM32F205/207/215/217	411	RERMCD1023 RERMCD1302	ST Rousset R8 ST Crolles C300
STM32F427/429/437/439	419	RERMCD1132 RERMCD1408	ST Rousset R8 ST Crolles C300
STM32F410	458	RERMCD1503	ST Crolles C300
STM32F401	423	RERMCD1219	ST Crolles C300
STM32F411	431	RERMCD1405	ST Crolles C300
STM32F401	433	RERMCD1303	ST Crolles C300
STM32F412	441	RERMCD1423	ST Crolles C300
STM32F413/F423	463	RERMCD1525	ST Crolles C300
STM32F745/746/750/756	449	RERMCD1309	ST Crolles C300
STM32F446	421	RERMCD1417	ST Crolles C300
STM32F469/479	434	RERMCD1407	ST Crolles C300
STM32F765/767/769/777/779	451	RERMCD1501	ST Crolles C300
STM32F722/723/730/732/733	452	RERMCD1524	ST Crolles C300

The packages used are already qualified for STM32 product families

Package	Qualification Report	Assembly Plant location	Final Test plant location
LQFP 176 24X24	RERMCD1023	ASE TAIWAN	ST MUAR
LQFP 144 20X20	RERMCD1312	AMKOR ATP1	AMKOR ATP3
LQFP 100 14x14	RERMCD1312	AMKOR ATP1	AMKOR ATP3
LQFP 64 10X10	RERMCD1313	AMKOR ATP1	AMKOR ATP1
LQFP 64 10X10	RERMCD1621	JSCC	JSCC
UFBGA 7x7 10X10	RERMCD1402	AMKOR ATP3	AMKOR ATP3
TFBGA 13x13	RERMCD1421	AMKOR ATP3	AMKOR ATP3
TFBGA 8x8	RERMCD1309	AMKOR ATP3	AMKOR ATP3
LQFP 208 28x28	RERMCD1518	AMKOR ATP1	AMKOR ATP3
UQFN 5x5 7x7	RERMCD1622	JSCC	JSCC
WLCSP	RERMCD1213	AMKOR ATT1	AMKOR ATT3

Based on these data, and according to "RELIABILITY TESTS AND CRITERIA FOR QUALIFICATION" specification (DMS 0061692), following qualification strategy has been defined:

Die Qualification:	3 diffusion lots for 413 cut1.3 1 diffusion lot for 411 cut2.5 1 diffusion lot for 419 cut2.2 3 diffusion lots for 458 cut1.0 1 diffusion lot for 423 cut1.1 1 diffusion lot for 431 cut1.0 1 diffusion lot for 433 cut1.1 1 diffusion lot for 441 cut3.0 1 diffusion lot for 463 cut1.0 1 diffusion lot for 449 cut 1.1 1 diffusion lot for 421 cut 1.0 1 diffusion lot for 434 cut 1.0 1 diffusion lot for 451 cut 1.1 1 diffusion lot for 452 cut 1.0
Package Qualification:	3 assembly lots for UFBGA176 10x10 1 assembly lot for LQFP 64 10X10 Au 1 assembly lot for LQFP 64 10X10 Ag 1 assembly lot for LQFP 144 20X20 1 assembly lot for LQFP 176 24X24 1 assembly lot for LQFP 208 28x28 1 assembly lot for LQFP 100 14x14 2 assembly lot for TFBGA 216 13X13 1 assembly lot for TFBGA 100 8X8 1 assembly lot for WLCSP90 linked to die 413 1 assembly lot for WLCSP36 linked to die 458 1 assembly lot for WLCSP143 linked to die 419 1 assembly lot (CDM Only) for WLCSP49 linked to die 431 1 assembly lot for UFQFPN48

Additional lots performed on subsequent design fixes.

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

3.1.1 Die related tests:

The die oriented test results are summarized in table 1.

Table 1. Die oriented test results

Die Related Tests - short description						Results		
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 1	Lot 2	Lot 3
						Die 413 Cut 1.3	Die 413 Cut 1.3	Die 413 Cut 1.3
Electrostatic discharge - Human Body Model								
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x3	2000V 1KV on VBAT domain	-	0/3	0/3	0/3
Electrostatic discharge - Charge Device Model								
ESD CDM	ANSI/ESD STM5.3.1	UFBGA176	3x3	Class C3	250V	0/3	0/3	0/3
LATCH UP								
LU	JESD78	NA	6x3	A0/R1 125°C	-	0/6	0/6	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x3	A0/R1 10kcy + 1500h bake	1500h	0/77	0/77	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x3	A0/R1 10kcy + 168h bake	168h	0/77	0/77	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x3	A0/R1 10kcy + 168h bake	168h	0/77	0/77	0/77
Early Life Failure Rate								
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	800x3	A0/R1 48h	48h	0/800	0/800	0/800
High Temperature Operating Live								
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x3	A0/R1 1200h	1200h	0/77	0/77	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 8
						Die 411 Cut 2.5
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V 1kV on VBAT domain	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA176	3x1	Class C4	500V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77X1	A0/R1 1200h	1200h	0/77



MDG-MCD Reliability Evaluation Report

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 9
						Die 419 Cut 2.2
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	TFBGA216	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6(*)
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

(*) MSV 5V on PA4 & PA5



MDG-MCD Reliability Evaluation Report

Die Related Tests - short description						Results		
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 10	Lot 11	Lot 12
						Die 458 Cut 1.0	Die 458 Cut 1.0	Die 458 Cut 1.0
Electrostatic discharge - Human Body Model								
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x3	2000V	-	0/3	0/3	0/3
Electrostatic discharge - Charge Device Model								
ESD CDM	ANSI/ESD STM5.3.1	LQFP64	3x3	Class C4	500V	0/3	0/3	0/3
LATCH UP								
LU	JESD78	NA	6x3	A0/R1 125°C	-	0/6	0/6	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x3	A0/R1 10kcy + 1500h bake	1500h	0/77	0/77	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x3	A0/R1 10kcy + 168h bake	168h	0/77	0/77	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x3	A0/R1 10kcy + 168h bake	168h	0/77	0/77	0/77
Early Life Failure Rate								
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	800x3	A0/R1 48h	48h	0/800	0/800	0/800
High Temperature Operating Live								
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x3	A0/R1 1200h	1200h	0/77	0/77	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 13
						Die 423 Cut 1.1
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	LQFP100	3x1	Class C4	500V	0/3
LATCH UP						
LU	JESD78	NA	6X1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 14
						Die 431 Cut 1.0
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	LQFP100	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 18
						Die 433 Cut 1.1
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	LQFP100	3x1	Class C4	500V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 19
						Die 441 Cut3.0
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA144 P0.8	3x1	Class C4	500V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 20
						Die 463 Cut1.0
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA144 P0.8	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 21
						Die 449 Cut1.1
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	TFBGA216 P0.8	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 26
						Die 421 Cut 1.0
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA144 P0.5	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 28
						Die 434 Cut 1.0
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA144 P0.5	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 29
						Die 451 Cut 1.1
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA144 P0.5	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 30
						Die 452 Cut 1.0
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA144 P0.5	3x1	Class C3	250V	0/3
LATCH UP						
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h bake	1500h	0/77
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage						
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77
Early Life Failure Rate						
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 125°C, 3V6	500x1	A0/R1 48h	48h	0/500
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 1200h	1200h	0/77

Die Related Tests - short description						Results	
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 31	Lot 32
						Die 413 cut 1.4	Die 411 cut 2.6
Electrostatic discharge - Human Body Model							
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500Ω, 100pF	3x1	2000V	-	0/3	0/3
Electrostatic discharge - Charge Device Model							
ESD CDM	ANSI/ESD STM5.3.1	UFBGA144 P0.5	3x1	Class C3	250V	0/3	NA
			3x1	Class C4	500V	NA	0/3
LATCH UP							
LU	JESD78	NA	6x1	A0/R1 125°C	-	0/6	0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage							
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h bake	168h	0/77	0/77
High Temperature Operating Live							
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x1	A0/R1 168h	168h	0/77	0/77

3.1.2 Packages related tests:

The package oriented test results are summarized in the following tables.

3.1.2.1 UFBGA10x10 176L package oriented test result

Package related Test						Results		
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 1	Lot 2	Lot 3
						Die 413 Cut 1.3	Die 413 Cut 1.3	Die 413 Cut 1.3
ESD Charge Device Model								
ESD CDM	ANSI/ESDA STM5.3.1	N.A	3x3	CLASS C3	250V	0/3	0/3	0/3
Preconditioning: moisture sensitivity level 3								
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	179x3	A0/R1	NA	0/179	0/179	0/179
Temperature Humidity Bias after Preconditioning								
THB	JESD 22-A101	85°C, 85% RH Bias 3v6	25x3	A0/R1 1000h	1000h	0/25	0/25	0/25
Thermal Cycling after Preconditioning								
TC	JESD 22-A104	-65c/+150°C	77x3	A0/R1 500cy	500cy	0/77	0/77	0/77
			77x3		1000cy for monitoring	0/77	0/77	0/77
High Temperature Storage Life after Preconditioning								
HTSL	JESD 22-A103	150°C	77x3	A0/R1 1000h	1000h	0/77	0/77	0/77
Construction Analysis								
CA	Construction Analysis including : -Wirebond shear -Wire bond pull -Solderability -Physical -Dimension	JESD 22B102 JESDB100/B108	50x3	--	No major concern	NC	NC	NC

Note : SAM done after PC, THB, TC, HTSL : No delamination observed



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3.1.2.3 QFP 10x10 64L, 14x14 100L, 20x20 144L, 24x24 176L & 28x28 208L package oriented test result:

	Package Related Tests					Results					
Description	Test/Method	Conditions	Sample Size	Criteria	Readout / Duration	LOT4 LQFP 10x10 (Ag)	LOT5 LQFP 10x10 (Au)	LOT6 LQFP 20x20	LOT7 LQFP 24x24	LOT17 LQFP 28x28	LOT24 LQFP 14x14
						Die 413 Cut1.3	Die 413 Cut1.3	Die 413 Cut1.3	Die 413 Cut1.3	Die 419 Cut2.0	Die 431 Cut1.0
ESD Charge Device Model											
ESD CDM	ANSI/ESDA STM5.3.1	N.A	3x6	Class C3	250V	0/3	0/3	0/3	0/3	0/3	0/3
Preconditioning: moisture sensitivity level 3											
PC	J-STD-020 JESD22-A113	MSL3	308x6	A0/R1	NA	0/308	0/308	0/308	0/308	0/308	0/308
High Temperature Storage Life after Preconditioning											
HTSL	JESD 22-A103	150°C	77x6	A0/R1 1000h	1000h	0/77	0/77	0/77	0/77	0/77	0/77
Thermal Cycling after Preconditioning											
TC	JESD 22-A104	-65c/ +150°C	77x6	A0/R1 500cy	500cy	0/77	0/77	0/77	0/77	0/77	0/77
					1000cy for monitoring	0/77	0/77	0/77	0/77	0/77	0/77
Temperature Humidity Bias after Preconditioning											
THB	JESD 22-A101	85°C/85%R H Bias 3v6	77x6	A0/R1 1000h	1000h	0/77	0/77	0/77	0/77	0/77	0/77 (500h)
Unbiased Highly Accelerated temperature after Preconditioning											
UHASt	JESD 22 A118	130°C ,85% 2Atm RH	77x6	A0/R1 96h	96h	0/77	0/77	0/77	0/77	0/77	0/77
Construction Analysis											
CA	Construction Analysis including : -Wirebond shear -Wire bond pull -Solderability -Physical -Dimension	JESD 22B102 JESDB100/ B108	50x6	NA	No major concern	NC	NC	NC	NC	NC	NC

Note : SAM done after PC, THB, TC, HTSL : No delamination observed



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3.1.2.4 TFBGA 13x13 216L, 8X8 100L package oriented test result:

Package related Test						Results		
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 9 TFBGA216 ATP3	Lot25 TFBGA100	Lot 31 TFBGA216 MUAR
						Die 419 Cut 2.2	Die 449 Cut1.1	Die 419 Cut 2.2
ESD Charge Device Model								
ESD CDM	ANSI/ESDA STM5.3.1	N.A	3x3	CLASS C3	250V	0/3	0/3	0/3
Preconditioning: moisture sensitivity level 3								
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	231x3	A0/R1	NA	0/231	0/231	0/231
Temperature Humidity Bias after Preconditioning								
THB	JESD 22-A101	85°C, 85% RH Bias 3v6	77x3	A0/R1 1000h	1000h	0/77	0/77	0/77
Thermal Cycling after Preconditioning								
TC	JESD 22-A104	-65c/+150°C	77x3	A0/R1 500cy	500cy	0/77	0/77	0/77
			77x3		1000cy for monitoring	0/77	0/77	0/77
High Temperature Storage Life after Preconditioning								
HTSL	JESD 22-A103	150°C	77x3	A0/R1 1000h	1000h	0/77	0/77	0/77
Construction Analysis								
CA	Construction Analysis including : -Wirebond shear -Wire bond pull -Solderability -Physical -Dimension	JESD 22B102 JESDB100/B108	50x3	NA	No major concern	No concern	No concern	No concern

Note: SAM done after PC, THB, TC, HTSL, Ufast : No delamination observed



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3.1.2.5 WLCSP143, WLCSP90, WLCSP36, WLCSP49 package oriented test result:

	Package Related Tests								
Description	Test/Method	Conditions	Sample Size	Criteria	Readout / Duration	LOT15 WLCSP143	LOT16 WLCSP90	LOT23 WLCSP36	LOT27 WLCSP49
						419 Cut2.0	413 Cut1.3	458 Cut1.0	431 Cut1.0
ESD Charge Device Model									
ESD CDM	ANSI/ESDA STM5.3.1	N.A	3x4	CLASS C3	250V	0/3		0/3	
				CLASS C3	400V				0/3
				CLASS C4	500V		0/3		
Preconditioning: moisture sensitivity level 1									
PC	J-STD-020 JESD22-A113	MSL1	308x3	Elect test A0/R1	NA	0/308	0/308	0/308	
High Temperature Storage Life after Preconditioning									
HTSL	JESD 22-A103	150°C	77x3	A0/R1 1000h	1000h	0/77	0/77	0/77	
Thermal Cycling after Preconditioning									
TC	JESD 22-A104	-65°C/+150°C	77x3	A0/R1 500cy	500cy	0/77	0/77	0/77	
					1000cy for monitoring	0/77	0/77	0/77	
Temperature Humidity Bias after Preconditioning									
THB	JESD 22-A101	85°C/85%RH Bias 3v6	77x3	A0/R1 1000h	1000h	0/77	0/77	0/77	
Unbiased Highly Accelerated temperature after Preconditioning									
UHASt	JESD 22 A118	130°C ,85% 2Atm RH	77x3	A0/R1 96h	96h	0/77	0/77	0/77	
Construction Analysis									
CA	Construction Analysis including : -Wirebond shear -Wire bond pull -Solderability -Physical -Dimension	JESD 22B102 JESDB100/B 108	50x3	NA	No major concern	NC	NC	NC	

Note: SAM done after PC, THB, TC, HTSL: No delamination observed

3.1.2.6 UFQFPN48 7X7 package oriented test result:

	Package Related Tests					Results
Description	Test/Method	Conditions	Sample Size	Criteria	Readout / Duration	LOT22 UQFPN48
						458 Cut1.0
ESD Charge Device Model						
ESD CDM	ANSI/ESDA STM5.3.1	N.A	3x1	CLASS C4	500V	0/3
Preconditioning: moisture sensitivity level 1						
PC	J-STD-020 JESD22-A113	MSL1	231x1	Elect test A0/R1	NA	0/308
High Temperature Storage Life after Preconditioning						
HTSL	JESD 22-A103	150°C	77x1	A0/R1 1000h	1000h	0/77
Thermal Cycling after Preconditioning						
TC	JESD 22-A104	-65°C/+150°C	77x1	A0/R1 500cy	500cy	0/77
					1000cy for monitoring	0/77
Temperature Humidity Bias after Preconditioning						
THB	JESD 22-A101	85°C/85%RH Bias 3v6	77x1	A0/R1 1000h	1000h	0/77
Construction Analysis						
CA	Construction Analysis including : -Wirebond shear -Wire bond pull -Solderability -Physical -Dimension	JESD 22B102 JESDB100/B108	50x1	NA	No major concern	NC

Note: SAM done after PC, THB, TC, HTSL: No delamination observed

4 APPLICABLE AND REFERENCE DOCUMENTS

- 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 for product qualification
- SOP 2.6.19: Process maturity level
- 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)
- JESD78A: IC Latch-up test
- JESD22-A103: High temperature storage life
- JESD22-A118: Temperature Humidity Storage – unbiased
- JESD22-A117: Endurance and Data retention
- J-STD-020D: Moisture/reflow sensitivity classification for no hermetic solid state surface mount devices
- JESD22-A113: Preconditioning of no hermetic surface mount devices prior to reliability testing
- JESD22-A101: Steady state temperature humidity bias life test
- JESD22-A118: Accelerated moisture resistance - unbiased hast
- JESD22-A104: Temperature cycling

5 GLOSSARY

EDR	NVM endurance, data retention
HTOL	High temperature operating life
HTB	High temperature bake
ESD HBM	Electrostatic discharge (human body model)
ESD CDM	Electrostatic discharge (charge device model)
LU	Latch-up
PC	Preconditioning (solder simulation)
THB	Temperature humidity bias
THS	Temperature Humidity Storage
TC	Temperature cycling
UHAST	Unbiased HAST
HTSL	High temperature storage life
ELFR	Early life failure rate
CA	Construction Analysis

6 REVISION HISTORY

Date	Revision	Author	Changes
01-March-2018	1.0	Bruno DERUDET	Initial release PCN10333
06-March-2018	2.0	Bruno DERUDET	413XXX4: Add final EDR 1500h results 411XXX3: Add reliability results
18-April-2018	3.0	Frederic BRAVARD	Correction of typo error for Pure Tin Tolerance data
04-July-2108	4.0	Bruno DERUDET	Add reliability results for die 419XXX5
13-July-2018	5.0	Frederic BRAVARD	Add PCN number PCN10595 linked to die 419XXX5
17-July-2018	6.0	Frederic BRAVARD	419: Add final Readout retention at 1500h
10-August-2018	7.0	Frederic BRAVARD	SER data: Add information for STM32F2x family
09-November-2018	8.0	Bruno DERUDET	Add PCN10544, PCN10596 & PCN10671 linked to Dice 458XXX1, 423XXX1, 431XXX1
03-December-2018	9.0	Bruno DERUDET	Add dice 433XXX1, 441XXX1, 463XXX1
04-January-2019	10.0	Frederic BRAVARD	Add PCN10703 linked to die 449XXX1
05-February-2019	11.0	Celine NAVARRO	TFBGA8x8, LQFP14x14, UQFN7x7, WLCSP36
19-February-2019	12.0	Mathieu MARIN	Add 421XXX1 results
07-October-2019	13.0	Frederic BRAVARD	Add WLCSP49 CDM results of die 431XXX1
		Céline NAVARRO	Add TFBGA216 13x13 Muar results
		Mathieu MARIN	Add PCN 10816 linked to dice 434XXX1, 451XXX1,
01-February-2021	14.0	Mathieu MARIN	Add PCN10896 linked to 413XXX5 & 411XXX4
14-May-2021	14.1	Dominique GALIANO	Correct PCN references 413XXX5 (PCN12791) & 411XXX4 (PCN12791)



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RERMCD1302

CMOSM10 in CROLLES wafer fab / 411XXX5

Product / Process information	
Commercial product	STM32F2x
Product line	411X66
Product description	STM32F 1Mbytes FLASH
Finish Good Code	STM32F207IGH6
Production Mask Set revision	411XXX5 (Cut2.6)
Product Division	Microcontrollers Division (MCD)
Silicon process technology	CMOSM10
Wafer fabrication location	CRL, ST Crolles, France
Electrical Wafer Sort test plant location	TPY, ST Singapore

Package information		
Package	Assembly Plant location	Final Test plant location
LQFP 176 (24x24)	ASE (TAIWAN)	ST MUAR, (MALAYSIA)
LQFP 144 (20x20)	AMKOR ATK1 (KOREA)	AMKOR ATK3 (KOREA)
LQFP 100 (14x14)	AMKOR ATK1 (KOREA)	AMKOR ATK3 (KOREA)
LQFP 64 (10x10)	STATS ChipPAC (SHANGHAI)	STATS ChipPAC (SHANGHAI)
UFBGA 176 (10x10)	AMKOR ATK4 (KOREA)	AMKOR ATK3 (KOREA)
WLCSP66	STATS ChipPAC Singapore	STATS ChipPAC Singapore

MMS Reliability Evaluation Report – M10 CROLLES

Reliability Evaluation Assessment: PASS

Approval List Document revision REV1.0			
Function	Site	Name	Date
Div Q&R Responsible	Rousset	JM.BOURGOGNE	Sept-2013
Div Quality Manager	Rousset	P.NARCHE	Sept-2013

Approval List Document Revision REV4.0		
Function	Name	Date
Div Q&R Responsible	Frederic BRAVARD	21-Jan-2015
Approval List Document Revision REV5.0		
Div Q&R Responsible	Frederic BRAVARD	26-Oct-2016
Approval List Document Revision REV6.0 & 6.1		
Div Q&R Responsible	Dominique GALIANO	29- Jan -2021 14 May 2021



MMS Reliability Evaluation Report – M10 CROLLES

Contents

1	RELIABILITY EVALUATION OVERVIEW	4
1.1	OBJECTIVES	4
1.2	CONCLUSION	4
1.3	CONTEXT	4
2	RELIABILITY TEST VEHICLE(S) CHARACTERISTICS	5
2.1	RELIABILITY TEST VEHICLE(S) DESCRIPTION	5
2.1.1	Reliability information.....	5
2.1.2	Front-End Information	7
2.1.3	Back-End Information	8
3	RELIABILITY EVALUATION PLAN / RESULTS SUMMARY	9
3.1	RELIABILITY EVALUATION : RESULTS SUMMARY	9
3.1.1	Die related tests:	9
3.1.2	Package related tests:	11
4	APPLICABLE AND REFERENCE DOCUMENTS	12
5	GLOSSARY	12
6	REVISION HISTORY	13

1 RELIABILITY EVALUATION OVERVIEW

1.1 Objectives

The purpose of this document is to assess the reliability of the product STM32F20x diffused in STM CROLLES waferfab 12", France, and assembled in the following package:

- For LQFP176 24x24 in ASE, Taiwan
- For LQFP144 20x20 in AMKOR ATK1, Korea
- For LQFP100 14x14 in AMKOR ATK1, Korea
- For LQFP64 10x10 in STATS ChipPAC Shanghai, China
- For WLCSP66 in STATS ChipPAC Singapore
- For UFBGA176 10x10 in AMKOR ATK4, Korea.

1.2 Conclusion

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

According to the reliability tests results, the qualification is granted for the STM32F20x F/G and its subsets, diffused in STM CROLLES 12" – France (die 411XXX1) and assembled in the above listed packages. The report has been updated with reliability results of die 411XXX2 linked to PCN8461.

This report has been updated with reliability results of 411XXX5 (Cut 2.6) linked to PCN 12791 (Flash GO1 band gap design fix).

1.3 Context

The CMOSM10 Technology Platform is qualified in CROLLES waferfab by a transfer from Rousset plant for additional sourcing.

- The STM32F2xx is used a qualification vehicle. It was already used as qualification driver to validate CMOSM10 technology in Rousset Waferfab.
- The chosen product code is STM32F207IGH6 assembled in UFBGA176 in AMKOR ATK4.

Based on these data and according to our "Reliability tests and criteria for qualifications" specification (ADCS 0061692), the following reliability strategy is :

- 3 qualification lots on 411/UFBGA176 used for reliability trials described in below table
- Additional lots performed on subsequent design fixes

2 RELIABILITY TEST VEHICLE(S) CHARACTERISTICS

2.1 Reliability Test vehicle(s) description

The STM32F20x is processed in CMOSM10 (90nm) diffused in CROLLES 12". The test vehicle used for the die reliability evaluation is assembled in UFBGA176+25 package in AMKOR.

The STM32F20x family is based on the high-performance ARM® Cortex™-M3 32-bit RISC core operating at a frequency of up to 120 MHz. The family incorporates high-speed embedded memories (Flash memory up to 1 Mbyte, up to 128 Kbytes of system SRAM), up to 4 Kbytes of backup SRAM, and an extensive range of enhanced I/Os and peripherals connected to two APB buses, two AHB buses and a 32-bit multi-AHB bus matrix

2.1.1 Reliability information

RER Lot ID	Lot 1	Lot 2	Lot 3	Lot 4
Finish Good	STM32F207IGH6	STM32F207IGH6	STM32F207IGH6	STM32F217IGH6
Die Name / Cut	411XXX1 / cut2.2	411XXX1 / cut2.2	411XXX1 / cut2.2	411XXX2 / cut2.5
Diffusion lot ID / wafer ID	Q239KHR	Q239KHR	Q239KHR	Q405512
Trace Code	HP305AFZ	HP305AFZ	HP305AFZ	7B443A3K
RELIS references	RSST1310001	RSST1310002	RSST1318005	RSST1451002
Laboratory location	Rousset	Rousset	Rousset	Rousset
Fab name location	CROLLES	CROLLES	CROLLES	CROLLES
EWS name location	TPY - Singapore	TPY - Singapore	TPY - Singapore	TPY - Singapore
Assembly plant location	AMKOR ATK4	AMKOR ATK4	AMKOR ATK4	AMKOR ATP3
FT name location	AMKOR ATK3	AMKOR ATK3	AMKOR ATK3	AMKOR ATP3
Package description	BGA176+25	BGA176+25	BGA176+25	BGA176+25



MMS Reliability Evaluation Report – M10 CROLLES

RER Lot ID	Lot 5
Finish Good	STM32F720IEH6\$PC
Die Name / Cut	411XXX5 (Cut 2.6)
Diffusion lot ID / wafer ID	VQ919715 / #24
Trace Code	7B931A7Y
RELIS references	GRAL1851015
Laboratory location	Grenoble
Fab name location	CROLLES
EWS name location	ARDE - Ardentec
Assembly plant location	AMKOR ATP3
FT name location	AMKOR ATP3
Package description	UFBGA176 P0.65 10X10X0.6

Comment: ST is certified ISO/TS 16949. This induces certification for all internal and subcontractor plants. ST certification document can be downloaded under the following link:
<http://best.st.com/Corporate/Quality/Documents/>

MMS Reliability Evaluation Report – M10 CROLLES

2.1.2 Front-End Information

	Diffusion Process
Wafer Fab Name	ST Crolles 300
Wafer Fab Location/ Address	STMicroelectronics, 850 rue Jean Monnet, 38926 Crolles Cedex, France
Process Technology Name	CMOSM10
Wafer Diameter	12 inch
Wafer Thickness	775+/-25 µm
Die Size	3 X 4 mm
Technology Mask Number	43
Layer Under Metallization - Material - Thickness	40nm Nitride + 600 nm Oxide
Metal Layers - Number - Materials - Thickness	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 1.450 µm
Passivation Layers - Number - Materials - Thickness	500nm Oxide + 550nm NITRIDE
Back Metal Finishing - Thickness	No
Die overcoat: - Material - Thickness	No
Other Device using same process	STM32F2xx 411x66
FIT Level (Ea=0.7eV, C.L: 60%, 55°C)	12.9 in 2012 limited by sample size
Soft Error Rate - Alpha SER [FIT/Mb] - Neutron SER [FIT/Mb] - Conditions	419 Fit/Mb 410 Fit/Mb 125°C 13n/cm²/h
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 Yes Yes Yes Yes Yes

2.1.3 Back-End Information

Package Description	UFBGA176	UFBGA176 P0.65 10X10X0.6
Assembly Plant Name	AMKOR ATK4	AMKOR ATP3
Assembly Plant Location/ Address	Site K4 - Gwangju 100, Amkor-ro, Buk-gu Gwangju 500-733 KOREA	119 North Science Avenue Special Economic Processing Zone, Binan Laguna, 4024, Philippines
Die Thickness after Back grinding	75 µm +/- 12	75 µm +/- 12
Die sawing method	Sawing	Step cut
Die attach material - Type (Glue/Film) - Supplier / refer	DAF Ablestik ATB130U	DAF Ablestik ATB130U
Wire bonding - Type / diameter - Supplier / characteristics - Method (ultrasonic / Thermosonic)	WIRE GOLD DIAM. 0.8 MIL	WIRE GOLD DIAM. 0.8 MIL
Lead Frame or substrate Material - Type / Thickness - Supplier / refer.	UFBGA 10X10 176+25 ATK4 SID101380731	UFBGA 10X10 176+25 DIE 411 ATP3
Lead Platings - Natures - Thickness	NA	NA
Balls Material & Diameter (BGA & CSP)	SOLDER BALLS WITH 200 DIAM SN96.5 AG3.5%	SOLDER BALLS WITH 2005 DIAM SN96.5 AG3.5%
Molding Compound / Resin encapsulation - Type - Supplier / refer.	MOLDING COMPOUND GE100LFCS	MOLDING COMPOUND GE100LFCS
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL3	MSL3



MMS Reliability Evaluation Report – M10 CROLLES

3 RELIABILITY EVALUATION PLAN / RESULTS SUMMARY

3.1 Reliability evaluation : results summary

Please find below the results table of reliability trials performed on the 3 qualification lots described in previous sections.

3.1.1 Die related tests:

The die oriented test results are summarized in table 1.

Table 1. Die oriented test results

Short description						Results			
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 1	Lot2	Lot3	Lot4
						411XX1 Cut 2.2	411XX1 Cut2.2	411XX1 Cut2.2	411XX2 Cut2.5
Electrostatic discharge - Human Body Model									
ESD HBM	JESD22-A114	1500 Ω, 100 pF	3x2	A0/R1 2000V Except Vbat domain 1KV		0/3			0/3
Electrostatic discharge - Charge Device Model									
ESD CDM	ANSI/ESD STM5.3.1	UFBGA176	3x2	A0/R1 500V		0/3			0/3
LATCH UP									
LU	JESD78	N.A	6x2	A0/R1 125°C		0/6			0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage									
EDR	JESD-22A117	HTB 175°C	77x3	A0/R1 10kcyc + 672h		0/77	0/77	0/77	
NVM Endurance & Data Retention – 10kcy EW @ 25°C then Storage									
EDR	JESD-22A117	HTB 175°C	77x3	A0/R1 10kcyc + 72h		0/77	0/77	0/77	
N NVM Endurance & Data Retention – 10kcy EW @ -40°C then Storage									
EDR	JESD-22A117	HTB 175°C	77x3	A0/R1 10kcyc + 72h		0/77	0/77	0/77	
Early Life Failure Rate									
ELFR	MIL-STD-883 Method 1005 JESD22-A108 JESD74	HTOL 140°C, 3V6	500x3 (min)	A0/R1 24h	24h	0/1500	0/800	0/1500	
High Temperature Operating Live									
HTOL	JESD-22A108	HTOL 140°C, 3V6	77x4	A0/R1 672h	168h	0/77	0/77	0/77	0/77
					672h	0/77	0/77	0/77	



MMS Reliability Evaluation Report – M10 CROLLES

Short description						Results
Description	Test/Method	Conditions	Sample Size	Criteria	Read out / Duration	Lot 5
						411XXX5 Cut 2.6
Electrostatic discharge - Human Body Model						
ESD HBM	ANSI/ESDA/ JEDEC JS-001	1500 Ω , 100 pF	3	A0/R1 2000V Except Vbat domain 1KV		0/3
Electrostatic discharge - Charge Device Model						
ESD CDM	ANSI/ESD STM5.3.1	UFBGA176	3	A0/R1 500V		0/3
LATCH UP						
LU	JESD78	N.A	6	A0/R1 125°C		0/6
NVM Endurance & Data Retention – 10kcy EW @ 125°C then Storage						
EDR	JESD-22A117	HTB 150°C	77	A0/R1 10kcyc + 168h		0/77
High Temperature Operating Live						
HTOL	JESD-22A108	HTOL 125°C, 3V6	77	A0/R1 168h	168h	0/77

MMS Reliability Evaluation Report – M10 CROLLES

3.1.2 Package related tests:

The package oriented test results are summarized in the following tables.

Table 2. UFBGA176 Package oriented test results

Short description						Results		
Descript.	Test/Method	Conditions	Sample Size	Criteria	Read out /Duration	Lot 1	Lot2	Lot3
						411XX1 Cut 2.2	411XX1 Cut2.2	411XX1 Cut2.2
Preconditioning: moisture sensitivity level 3								
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR- reflows	308X3	A0/R1		0/308	0/308	0/308
Temperature Humidity Bias after Preconditioning								
THB	JESD 22- A101	85°C, 85% RH Vdd=3v6	77X3	A0/R1 1000h	1000h	0/77	0/77	0/77
Unbiased HAST after Preconditioning								
UHA	JESD 22- A118	Ta=130°C 85%RH	77X3	A0/R1 96h	96h	0/77	0/77	0/77
Thermal Cycling after Preconditioning								
TC	JESD 22-A104	-50°C/+150°C	77X3	A0/R1 1000cy	1000cy	0/77	0/77	0/77
High Temperature Storage Life after Preconditioning								
HTSL	JESD 22-A103	150°C	77X3	A0/R1 1000h	1000h	0/77	0/77	0/77

Note: SAM done after PC, THB, UHA, TC
No delamination observes



4 APPLICABLE AND REFERENCE DOCUMENTS

- DMS 0061692: RELIABILITY TESTS AND CRITERIA FOR QUALIFICATIONS
- AEC-Q100: Stress test qualification for integrated circuits
- 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 for product qualification
- SOP 2.6.19: Process maturity level

- JESD22-A114: electrostatic discharge (ESD) sensitivity testing human body model (HBM)
- JESD22-A115: Electrostatic discharge (ESD) sensitivity testing machine model (MM)
- ANSI-ESD STM5.3.1: Electrostatic discharge (ESD) sensitivity testing charge device model (CDM)

- JESD78A: IC Latch-up test
- JESD22-A103: High temperature storage life
- JESD22-A117: Endurance and Data retention

- J-STD-020D: Moisture/reflow sensitivity classification for nonhermetic solid state surface mount devices
- JESD22-A113: Preconditioning of nonhermetic surface mount devices prior to reliability testing
- JESD22-A101: Steady state temperature humidity bias life test
- JESD22-A118: Accelerated moisture resistance - unbiased hast
- JESD22-A104: Temperature cycling

- Mil Std 883 Method 2011: Wire Bond pull test
- AEC Q100-001: Wire Bond shear test
- JESD 22B102: Solderability test
- JESD22B100/B108: Physical dimension

5 GLOSSARY

EDR	NVM endurance, data retention and operational life
HTOL	High temperature operating life
LTOL	Low temperature operating life
HTB	High temperature bake
WEB	Program/Erase endurance cycling + bake
ESD HBM	Electrostatic discharge (human body model)
ESD MM	Electrostatic discharge (machine model)
ESD CDM	Electrostatic discharge (charge device model)
LU	Latch-up
PC	Preconditioning (solder simulation)
THB	Temperature humidity bias
TC	Temperature cycling
TMSK	Thermal shocks
UHAST	Unbiased HAST
HTSL	High temperature storage life
ELFR	Early life failure rate



MMS Reliability Evaluation Report – M10 CROLLES

6 REVISION HISTORY

Version	Date	Author	Comment
1.0	Sept-2013	Jean-Marc BOURGOGNE	Initial release
2.0	Jan-2014	Jean-Marc BOURGOGNE	
3.0	22 nd January 2015	Frederic BRAVARD	Add THB VDD condition
4.0	28 th January 2015	Aziz MACHOUAT	Add reliability results of cut 2.5 (411XXX2) linked to PCN8461
5.0	26 th October 2016	Frederic BRAVARD	Typo error: Correction the Metal 7 thickness
6.0	January 29, 2021	Mathieu MARIN	Update with reliability of cut 2.6 (411XXX5)
6.1	May 14, 2021	Dominique GALIANO	Update PCN reference

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PRODUCT/PROCESS CHANGE NOTIFICATION PCN12791 – Additional information

STM32F2x 1MB products improvement – on listed products

MDG - Microcontrollers Division (MCD)

What are the changes?

Changes described in table below:

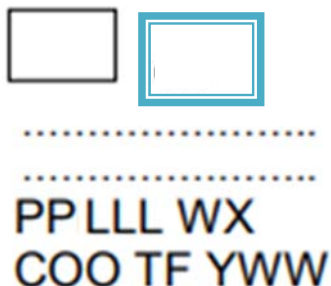
Products	Wafer FAB site	Additional Information	
		<u>Actual</u>	<u>New</u>
STM32F2x	Crolles 300 (France)	"2"	"5"
	TSMC Fab14 (Taiwan)	"3"	"4"

- (1) Package darkness changes depending on molding compound.
- (2) All other Package Outline Assembly (POA) dimensions remain unchanged.

Note: 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?

The standard marking is:



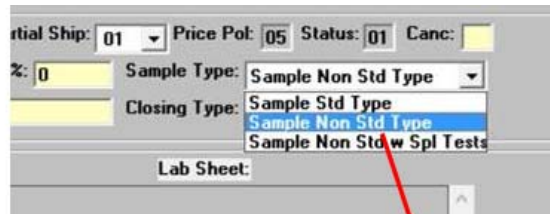
Additional Information indicates product line version.

Please refer to 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 “**PCN12791**” into the NPO Electronic Sheet/**Regional Sheet**
- request sample(s) through Notice tool, indicating a single Commercial Product for each request

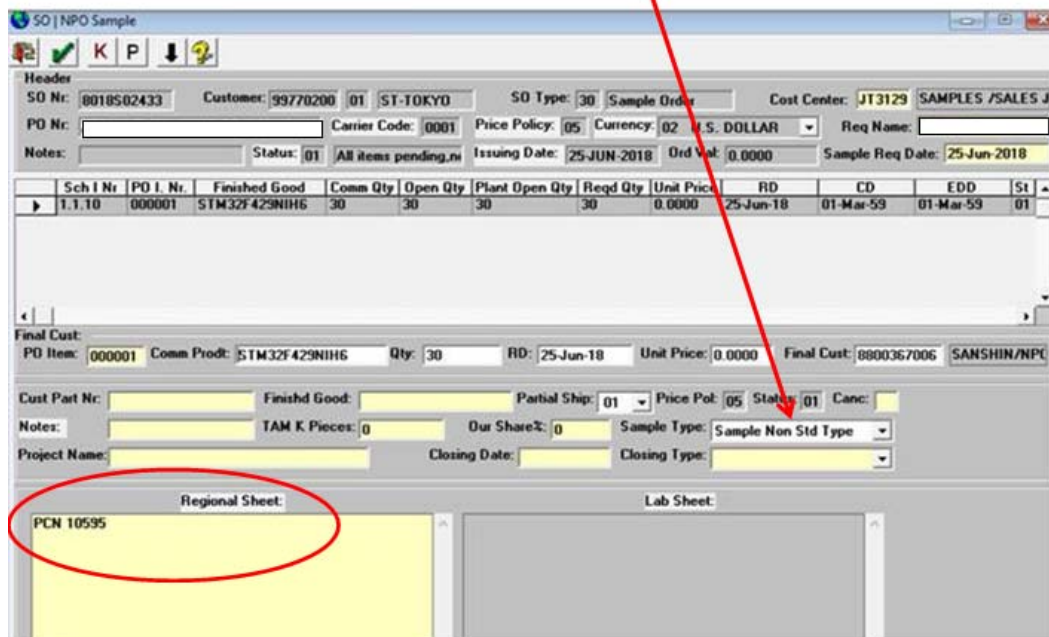


Partial Ship: 01 Price Pol: 05 Status: 01 Canc: ☐

%: 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: 0018502433 Customer: 99770200 01 ST-TOKYO SO Type: 30 Sample Order Cost Center: JT3129 SAMPLES /SALES J

PD Nr: Carrier Code: 0001 Price Policy: 05 Currency: 02 U.S. DOLLAR Req Name:

Notes: Status: 01 All items pending. 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: PD Item: 000001 Comm Prod: STM32F429NIH6 Qty: 30 RD: 25-Jun-18 Unit Price: 0.0000 Final Cust: 8800367006 SANSHIN/NP

Cust Part Nr: Finishd 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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PCN Title : STM32F209 1Mb product improvement – on listed products

PCN Reference : MDG/21/12791

Subject : Public Products List

Dear Customer,

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

STM32F205VCT7TR	STM32F205ZCT6TR	STM32F205ZGT6W
STM32F207IFH6TR	STM32F205RCT6TR	STM32F215RGT6
STM32F205RFT6TR	STM32F207ZGT6TR	STM32F217VGT6
STM32F205RGT6V	STM32F215RGT6TR	STM32F207VCT6TR
STM32F207ZFT6	STM32F205RBT6TR	STM32F205RBT6
STM32F215VET6	STM32F207IEH6	STM32F205RET7
STM32F207ZGT7	STM32F217ZGT6	STM32F215RET6
STM32F205VCT6	STM32F215VGT7	STM32F207ZET6TR
STM32F207VCT6	STM32F207IFT6	STM32F217IET6
STM32F207IGT6	STM32F205RET6	STM32F205RGT7
STM32F217VET6	STM32F217ZET6	STM32F215VGT6
STM32F205RFT6	STM32F207VFT6TR	STM32F207VGT6TR
STM32F205VET6TR	STM32F207IGH6TR	STM32F205VFT6
STM32F205RGT6TR	STM32F205VGT7	STM32F217ZET7
STM32F205ZET6	STM32F205RCT6	STM32F205VCT6TR
STM32F215ZGT6	STM32F207VET6TR	STM32F207ZCT7
STM32F207IGT7	STM32F217VGT6TR	STM32F207ZGT6
STM32F207VET6	STM32F205ZET7	STM32F207VCT7
STM32F217IGH6	STM32F215RET6TR	STM32F215ZGT7TR
STM32F207IGH7	STM32F207ICT6	STM32F217IGT6
STM32F205VET7	STM32F217IGT7	STM32F207IEH6TR
STM32F205RBT7	STM32F217IEH6	STM32F205VGT6W
STM32F207ZET6	STM32F205VFT6TR	STM32F205VGT6
STM32F205ZGT6V	STM32F205ZET7TR	STM32F205RGT6W
STM32F205ZCT7TR	STM32F205VET7TR	STM32F205VGT6V
STM32F207VGT7	STM32F215ZET6	STM32F205VCT7
STM32F205ZET6TR	STM32F205RET7TR	STM32F217VET6TR
STM32F205RGT6	STM32F215ZGT7	STM32F205ZGT7TR
STM32F205VGT6TR	STM32F205RET6TR	STM32F207VFT6
STM32F205VBT6	STM32F205RCT7	STM32F207VGT6
STM32F207IFH6	STM32F205ZGT6TR	STM32F207ICH6
STM32F205ZGT7	STM32F205ZGT6	STM32F205ZCT6
STM32F205REY6TR	STM32F207IET6	STM32F207ZCT6
STM32F205RCT7TR	STM32F207IGH6	STM32F205ZCT7
STM32F205ZFT6	STM32F205RGY6TR	STM32F205VGT7TR
STM32F205VET6	STM32F215ZET6TR	STM32F207ZCT7TR



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