PRODUCT/PROCESS CHANGE NOTIFICATION
PCN 10029 - Additional information

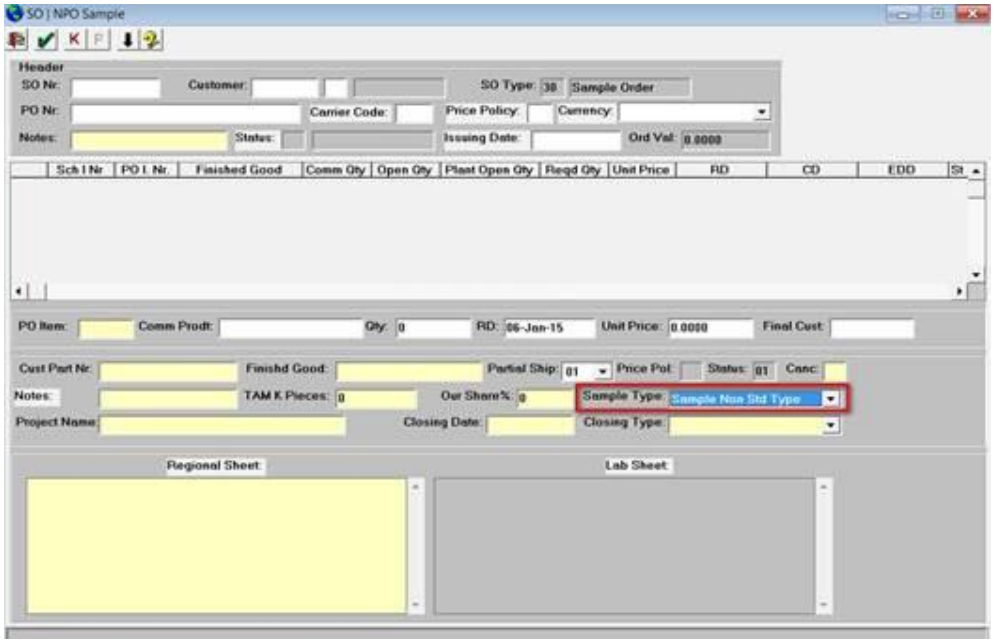
PCN9942 replacement - STM32F7x 2MB - die minor revision & Optimized substrate layout on TFBGA package only

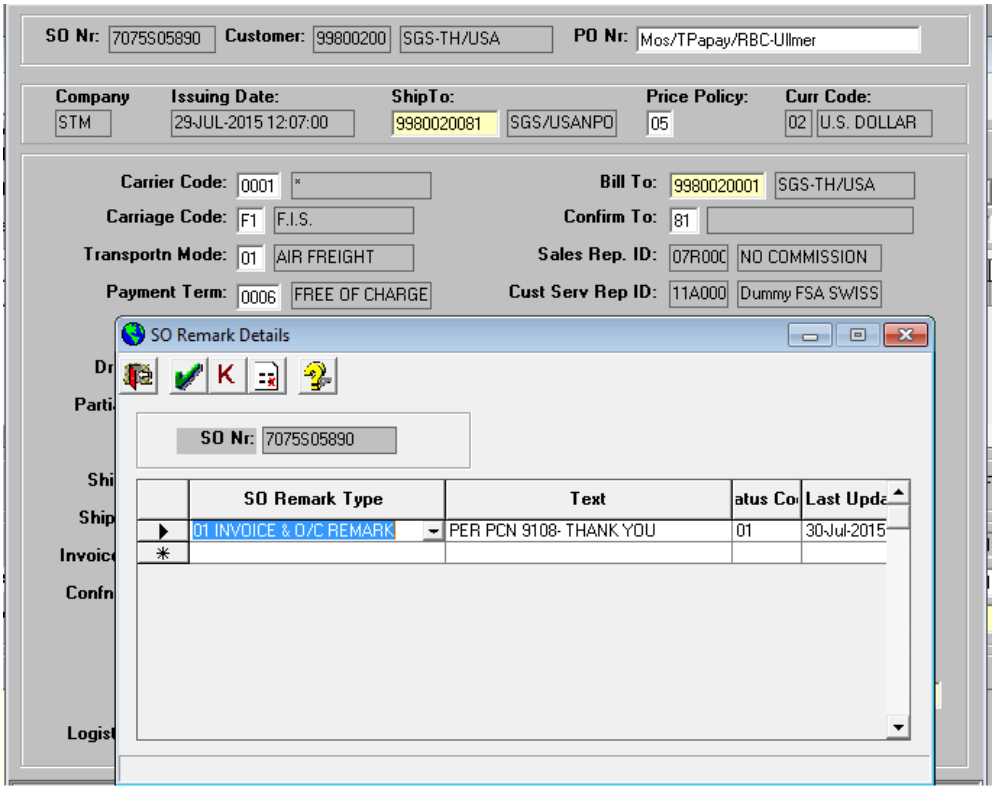
MMS - Microcontrollers Division (MCD)

How to order samples?

For all sample request linked to this PCN, please:

- request sample(s) through Notice tool, indicating a single Commercial Product for each request.
- insert “PCN 10029” into the remarks of your order.
- place **non standard** sample order using the following field in your system.

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Customer: 99800200 SGS-TH/USA
PO Nr: Mos/TPapay/RBC-Ullmer
Company
Issuing Date:
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Carrier Code: 0001
Carriage Code: F1 F.I.S.
Transportn Mode: 01 AIR FREIGHT
Payment Term: 0006 FREE OF CHARGE
Bill To: 9980020001 SGS-TH/USA
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MMS RELIABILITY EVALUATION REPORT

Identification Number: RERMCD1501

Product Evaluation STM32F7x – 2M

CMOSM10 90nm FLASH EMBEDDED

Qualification Type: Product & Package Evaluation

Product / Process information	
Commercial product	STM32F7x
Product line	451X66
Product description	STM32F7x 2Mbytes FLASH
Finish Good Code	STM32F767x / F769x / F778x
Production Mask Set revision	451XXXZ cut1.1
Product Division	Microcontrollers Division (MCD)
Silicon process technology	CMOSM10 90nm
Wafer fabrication location	ST Crolles 300 (12'), France
Electrical Wafer Sort test plant location	ST ROUSSET

Reliability Evaluation assessment: PASS

Approval List: Document revision REV1.0			
Function	Site	Name	Date
Div Q&R Responsible	Grenoble Rousset	Dominique GALIANO Frederic BRAVARD	5-Jan-2016
Div Quality Manager	Rousset	Pascal NARCHE	8-Jan-2016

Approval List: Document revision REV1.8			
Function	Site	Name	Date
Div Q&R Responsible	Grenoble Rousset	Dominique GALIANO Frederic BRAVARD	7-June-2016

Approval List: Document revision REV1.9			
Function	Site	Name	Date
Div Q&R Responsible	Grenoble Rousset	Dominique GALIANO Frederic BRAVARD	20-Dec-2016

Approval List: Document revision REV2.0			
Function	Site	Name	Date
Div Q&R Responsible	Grenoble Rousset	Dominique GALIANO Frederic BRAVARD	11-Jan-2017

Contents

1 RELIABILITY EVALUATION overview

1.1 Objectives

The aim of this report is to present the results of reliability evaluation performed on STM32F7x - die 451XXXZ 2Mbytes, diffused in ST Crolles 300 (CMOSM10 90nm), and assembled on the following packages:

- TFBGA216 13x13 DSI and no DSI AMKOR ATP3
- UFBGA176 10x10 AMKOR ATP3
- LQFP208 28x28 DSI and no DSI AMKOR ATP1
- LQFP176 24x24 DSI and no DSI ASE TAIWAN
- LQFP144 20x20 AMKOR ATP1
- LQFP100 14x14 AMKOR ATP1
- WLCSP180 REG ON REG OFF AMKOR ATT1

1.2 Conclusion

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

According to good reliability tests results, the qualification is granted for the STM32F7x – 2M - die 451XXXZ-, diffused in ST Crolles 12” – France, for defined mission profile and assembled in below packages

- TFBGA216 13x13 DSI and no DSI 13x13 in AMKOR ATP3 Philippine
- LQFP208 28x28 DSI and no DSI 28x28 in AMKOR ATP1 Philippine
- UFBGA176 in AMKOR ATP3 Philippine
- LQFP176 DSI and no DSI ASE TAIWAN
- LQFP144 20x20 AMKOR ATP1 Philippine
- LQFP100 14x14 AMKOR ATP1 Philippine
- WLCSP180 REG ON and REGOFF AMKOR ATT1 TAIWAIN

Refer to section Reliability evaluation: results summary for details on reliability test results.

2 RELIABILITY Device Characteristics

2.1 Reliability Device description

STM32F7x - 2M – die 451XXXZ - extends the Cortex-M7 family. It embeds a Flash memory up to 2 Mbytes, 512KB RAM and additional features and graphic performances.

The STM32F7x family operates in the –40 to +105 °C temperature range, from a 1.8 V – 3.6V (PDR ON) and 1.7-3.6V (PDR_OFF) power supply.

For additional information concerning the product behavior, refer to STM32F7x datasheet

2.2 Reliability Device Traceability

2.2.1 Reliability information

Devices used for die and package reliability evaluation:

RER Lot ID	Lot 1	Lot 2	Lot 3	Lot 4
Finish Good	ES32F769NIH6$G1	ES32F769NIH6$P1	ES32F767NIH6$P1	ES32F769BIT6$P1
Die Name / Cut	451XXXA Cut1.0	451XXXA Cut1.0	451XXXA Cut1.0	451XXXA Cut1.0
Laboratory location	ST GRENOBLE, France	ST GRENOBLE, France	ST GRENOBLE, France	ST GRENOBLE, France
Fab name location	ST CROLLES 300, France	ST CROLLES 300, France	ST CROLLES 300, France	ST CROLLES 300, France
EWS name location	ST ROUSSET	ST ROUSSET	ST ROUSSET	ST ROUSSET
Assembly plant location	ST GRENOBLE	AMKOR ATP3	AMKOR ATP3	AMKOR ATP1
FT name location	ST GRENOBLE	ST GRENOBLE	ST GRENOBLE	ST GRENOBLE
Package description	TFBGA216 13x13 DSI	TFBGA216 13X13 DSI	TFBGA216 13x13 no DSI	LQFP208 28x28 DSI

RER Lot ID	Lot 5	LOT6	LOT7	LOT8
Finish Good	ES32F767BIT6$P1	ES32F767IIK6$P1	ES32F767ZIT6$P1	ES32F767VIT6$P1
Die Name / Cut	451XXXA Cut1.0	451XXXA Cut1.0	451XXXA Cut1.0	451XXXA Cut1.0
Laboratory location	ST GRENOBLE, France	ST GRENOBLE, France	ST GRENOBLE, France	ST GRENOBLE, France
Fab name location	ST CROLLES 300, France	ST CROLLES 300, France	ST CROLLES 300, France	ST CROLLES 300, France
EWS name location	ST ROUSSET	ST ROUSSET	ST ROUSSET	ST ROUSSET
Assembly plant location	AMKOR ATP1	AMKOR ATP3	AMKOR ATP1	AMKOR ATP1
FT name location	ST GRENOBLE	ST GRENOBLE	ST GRENOBLE	ST GRENOBLE
Package description	LQFP208 28x28 no DSI	UFBGA176 10x10	LQFP144 20x20	LQFP100 14x14

RER Lot ID	Lot 9	LOT10	LOT11	LOT12
Finish Good	ES32F769IIT6$E1	ES32F767IIT6$E1	ES32F769AIY6$T1	32F778AIY6TR$T1
Die Name / Cut	451XXXA Cut1.0	451XXXA Cut1.0	451XXXA Cut1.0	451XXXA Cut1.0
Laboratory location	ST GRENOBLE, France	ST GRENOBLE, France	ST GRENOBLE, France	ST GRENOBLE, France
Fab name location	ST CROLLES 300, France	ST CROLLES 300, France	ST CROLLES 300, France	ST CROLLES 300, France
EWS name location	ST ROUSSET	ST ROUSSET	ST ROUSSET	ST ROUSSET
Assembly plant location	ASE TAIWAN	ASE TAIWAN	AMKOR ATT1	AMKOR ATT1
FT name location	ST GRENOBLE	ST GRENOBLE	ST GRENOBLE	ST GRENOBLE
Package description	LQFP176 24x24 DSI	LQFP176 24x24 No DSI	WLCSP180 REGON	WLCSP180 REGOFF

RER Lot ID	Lot 13	LOT14	LOT15
Finish Good	ES32F769NIH6$G3	32F769NIH6$43	32F767NIH6$43
Die Name / Cut	451XXXZ Cut1.1	451XXXZ Cut1.1	451XXXZ Cut1.1
Laboratory location	ST GRENOBLE, France	ST GRENOBLE, France	ST GRENOBLE, France
Fab name location	ST CROLLES 300, France	ST CROLLES 300, France	ST CROLLES 300, France
EWS name location	ST ROUSSET	ST ROUSSET	ST ROUSSET
Assembly plant location	ST GRENOBLE	AMKOR ATP3	AMKOR ATP3
FT name location	ST GRENOBLE	ST GRENOBLE	ST GRENOBLE
Package description	TFBGA216 13x13 DSI	TFBGA216 13X13 DSI	TFBGA216 13x13 no DSI

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/

2.2.2 Front-End Information

	Diffusion FAB
Wafer Fab Name	ST Crolles 300
Wafer Fab Location/ Address	STMicroelectronics, Crolles 2, 850 rue Jean Monnet, 38926, CROLLES, France
Process Technology Name	CMOSM10 90nm
Wafer Diameter	12 inch
Wafer Thickness	775µm +/- 25µm
Die Size	6130 µm x 5572 µm
Technology Mask Number	42
Layer Under Metallization - Material - Thickness	40 nm 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	PSG + UV Nitride (tot:1.1 µm)
Back Metal Finishing - Thickness	NA
Die overcoat: - Material - Thickness	NA
Other Device using same process	STM32F4x and STM32F7x family
FIT Level (Ea=0.7eV, C.L: 60%, 55°C)	FIT = 4.3 at qualification date
Soft Error Rate - Alpha SER [FIT/Mb] - Neutron SER [FIT/Mb] - Conditions	Alpha SER: 525 Fit/Mb condition: 0.001 α/cm²/h Neutron SER: 1195 Fit/Mb condition 125°C 13 n/cm²/h (>400MeV)
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

2.2.3 Back-End Information

Package Description	TFBGA216 13x13 DSI / no DSI	LQFP208 28x28 DSI/ no DSI	UFBGA176	LQFP144
Assembly Plant Name	AMKOR ATP3	AMKOR ATP1	AMKOT ATP3	AMKOR ATP1
Assembly Plant Location/ Address	119 North Science Avenue Special Economic Processing Zone Laguna Technopark, Binan Laguna PHILIPPINES 4024	Site P1 KM22 East Service Road Special Economic Zone Cupang, Muntinlupa City PHILIPPINES 1702	Site P3 119 North Science Avenue Special Economic Processing Zone Laguna Technopark, Binan Laguna PHILIPPINES 4024	Site P1 KM22 East Service Road Special Economic Zone Cupang, Muntinlupa City PHILIPPINES 1702
Die Thickness after Back grinding	180µm +/- 25µm	375+/-25 µm	75 µm +/- 12	375+/-25µm
Die sawing method	Sawing	Sawing	Sawing	Step cut
Die attach material **- Type (Glue/Film)** **- Supplier / refer**	ABLEBOND GLUE 2300	DA MATERIAL FOR LQFP AP4200	DAF Ablestik ATB130U	Glue epoxy CRM-1076YB SUMITOMO
Wire bonding **- Type / diameter** **- Supplier / characteristics** **- Method (ultrasonic / Thermosonic)**	WIRE GOLD DIAM. 0.8 MIL	WIRE GOLD DIAM. 0.8 MIL	WIRE GOLD DIAM. 0.8 MIL	GOLD WIRE 2N 0.8MIL TANAKA
Lead Frame or substrate Material **- Type / Thickness** **- Supplier / refer.**	TFBGA 13X13 216	LF FOR LQ 208L PAD 6.5 SQ	SUBS UFBGA 10x10 Low CTE	Pre plated Frame NiPdAu 5.75sq SHINKO
Lead Plating **- Natures** **- Thickness**	NA	PUR TiN 10µm thickness : tolerance 7 to 20 µm for connections	NA	Pur tin DR plating with slots C194
Balls Material & Diameter (BGA & CSP)	SOLDER BALL SAC 105 DIAM 0.35 mm	NA	SOLDER BALLS WITH 200 DIAM SN96.5 AG3.5%	NA
Routing Layer Material (CSP)	NA	NA	NA	NA
PBO Passivation (CSP)	NA	NA	NA	NA
Back side coating (CSP) **- Material** **- Thickness**	NA	NA	NA	NA
Molding Compound / Resin encapsulation **- Type** **- Supplier / refer.**	MOLDING COMPOUND GE100LFCS	RESIN SUMITOMO G631HQ	MOLDING COMPOUND GE100LFCS	Resin G631HQ SUMITOMO
Package Moisture Sensitivity Level (JEDEC J-STD020D)	MSL3	MSL3	MSL3	MSL3

Package Description	LQFP100 14x14	LQFP176 DSI / no DSI	WLCSP180 REGON / REGOFF
Assembly Plant Name	AMKOR ATP1	ASE TAIWAN	AMKOR ATT1
Assembly Plant Location/ Address	Site P1 KM22 East Service Road Special Economic Zone Cupang, Muntinlupa City PHILIPPINES 1702	26 Chin 3rd Road Nantze Export Processing Zone, Kaohsiung, Taiwan 811, R.O.C TAIWAN	No.11, Guangfu Road Hsinchu Industrial Park Hukou County HSINCHU 303 TAIWAN R.O.C
Die Thickness after Back grinding	375µm +/- 25µm	300µm +/- 25µm	355µm +/- 25 µm
Die sawing method	Sawing	Sawing	Laser Grooving + Mechanical dicing
Die attach material **- Type (Glue/Film)** **- Supplier / refer**	Sumitomo Epoxy CRM 1076YB	GLUE YIZTECH 8143 ASE TAIWAN	NA
Wire bonding **- Type / diameter** **- Supplier / characteristics** **- Method (ultrasonic / Thermosonic)**	WIRE GOLD DIAM. 0.8 MIL	WIRE GOLD 2N DIAM. 0.8 MIL	NA
Lead Frame or substrate Material **- Type / Thickness** **- Supplier / refer.**	LQFP100 14x14 Pure Tin	A19506-0 FOR LQFP 176L ASE WITH SLOT 243 sq	NA
Lead Plating **- Natures** **- Thickness**	Pur tin DR plating with slots C194	Pur tin DR plating with slots C7025	NA
Balls Material & Diameter (BGA & CSP)	NA	NA	SOLDER BALL SACN125 230 µm
Routing Layer Material (CSP)	NA	NA	Copper RDL Ti/Cu/Cu UBM
PBO Passivation (CSP)	NA	NA	HD8820
Back side coating (CSP) **- Material** **- Thickness**	NA	NA	Back side coating PET film 25 um
Molding Compound / Resin encapsulation **- Type** **- Supplier / refer.**	G631HQ Sumitomo	RESIN SUMITOMO EME-G631H ASE TAIWAN	NA
Package Moisture Sensitivity Level **(JEDEC J-STD020D)**	MSL3	MSL3	MSL1

3 RELIABILITY EVALUATION PLAN / strategy & results summary

3.1 Reliability evaluation : strategy & results summary

The STM32F7x (die 451XXXZ) is processed in the CMOSM10 90nmFLASH embedded process. This technology has been qualified on STM32F2x product family.

Product	Qualification Report
STM32F207	RERMCD 1302

Below package configurations are qualified for STM32Fx products in CMOSM10

- TFBGA13x13 216L AMKOR ATP3
- UFBGA10x10 176L AMKOR ATP3
- LQFP14x14 100L AMKOR ATP1
- LQFP20x20 144L AMKOR ATP1
- LQFP24x24 176L ASE
- LQFP28x28 208L AMKOR ATP1
- WLCSP AMKOR ATT1

Corresponding references

Package	Assy site	Reliability report
TFBGA13x13 216L	AMKOR ATP3	RERMCD1421
UFBGA10x10 176L	AMKOR ATP3	RERMCD1402
LQFP28x28 208L	AMKOR ATP1	RERMCD1408
LQFP24x24 176L	ASE (TAIWAN)	RERMCD1416
LQFP20x20 144L	AMKOR ATP1	RERMCD1312
LQFP14x14 100L	AMKOR ATP1	RERMCD1312
WLCSP180	AMKOR ATT1	RERMCD1213

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

- Die Qualification :
  - Full reliability exercise on 1 diffusion lot for cut1.0 (in TFBGA13x13 216L package from Grenoble)
  - Set of reliability trials on 1 diffusion lot for cut1.1 (in TFBGA13x13 216L package from Grenoble)

- Package Qualification :
  - 1 assembly lot for package trials in TFBGA216 package from ATP3
  - 1 assembly lot for package trials in UFBGA176 package from ATP3
  - 1 assembly lot for package trials in LQFP208 package from ATP1
  - 1 assembly lot for package trials in LQFP176 package from ASE
  - 1 assembly lot for package trials in LQFP144 package from ATP1
  - 1 assembly lot for package trials in LQFP100 package from ATP1
  - 1 assembly lot for ESD CDM and C.A in WLCSP180 package from ATT1.

3.2 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			
D e s c r	***Test/ Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out / Duration***	***Lot 1***	***Lot 2***	***Lot 3***	***Lot 13***
Die 451						Cut 1.0	Cut 1.0	Cut 1.0	Cut 1.1
	Electrostatic discharge - Human Body Model								
ESD - HBM	ANSI/ ESDA/ JEDEC JS-001	TFBGA216 DSI	3x2	A0/R1 2000V		0/3			0/3
		TFBGA216 no DSI	3x1	A0/R1 2000V				0/3	
	Electrostatic discharge - Charge Device Model								
ESD - CDM	ANSI/ ESD STM 5.3.1	TFBGA216 DSI	3x1	Class 3	250V	0/3			
		TFBGA216 DSI	3x1	Class 3	250V		0/3		
		TFBGA216 no DSI	3x2	Class 3	250V			0/3	0/3
	LATCH UP								
LU	JESD 78	TFBGA216 DSI	6x1	A0/R1 130°C	130°C	0/6			
		TFBGA216 no DSI	6x3	A0/R1 130°C	130°C	0/6		0/6	0/6
	NVM Endurance & Data Retention – 10kCycle EW @ 125°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 1500h	1500h	0/77			
	NVM Endurance & Data Retention – 10kCycle EW @ 25°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h	168h	0/77			
	N NVM Endurance & Data Retention – 10kCycle EW @ -40°C then Storage								
EDR	JESD-22A117	HTB 150°C	77x1	A0/R1 10kcy + 168h	168h	0/77			
	Early Life Failure Rate								
E L F R	MIL-STD-883 Method 1005 JESD22-A108 JESD74	ELFR 125°C, 3V6	500x1	A0/R1 48h	48h	0/500			
	High Temperature Operating Live								
HTOL	JESD-22A108	HTOL 125°C, 3V6	77x2	A0/R1 1200h	168h				0/77
					1200h	0/77			

Note:

LU current injection with REG_ON set-up done with 2.2µF on VCAP pins.

3.3 Package related tests:

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

Table 1. TFBGA216 DSI ATP3 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 2***
Die 451						Cut 1.0
Preconditioning: moisture sensitivity level 3						
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	231X1	A0/R1		0/231
Temperature Humidity Bias after Preconditioning						
THB	JESD 22-A101	85°c, 85% RH VDD=3v6	77X1	A0/R1 1000h	1000h	0/77
Thermal Cycling after Preconditioning						
TC	JESD 22-A104	-50°c/+150°c	77X1	A0/R1 1000cy	1000cy	0/77
High Temperature Storage Life after Preconditioning						
HTSL	JESD 22-A103	150°c	77X1	A0/R1 1000h	1000h	0/77

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 14***
Die 451						Cut 1.1
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	TFBGA216 DSI	3x1	Class 3	250v	0/3

Table 2. LQFP208 DSI ATP1 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 4***
Die 451						Cut 1.0
Preconditioning: moisture sensitivity level 3						
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	231X1	A0/R1		0/308
Temperature Humidity Bias after Preconditioning						
THB	JESD 22-A101	85°c, 85% RH VDD=3v6	77X1	A0/R1 1000h	1000h	0/77
Thermal Cycling after Preconditioning						
TC	JESD 22-A104	-50°c/+150°c	77X1	A0/R1 1000cy	1000cy	0/77
High Temperature Storage Life after Preconditioning						
HTSL	JESD 22-A103	150°c	77X1	A0/R1 1000h	1000h	0/77
Unbiased HAST						
uHAST	JESD 22-A118	130°C, 85%	77X1	A0/R1 1000h	96h	0/77
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	LQFP208 DSI	3x1	Class 3	250v	0/3

Table 3. LQFP208 no DSI ATP1 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 5***
Die 451						Cut 1.0
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	LQFP208 no DSI	3x1	Class 3	250v	0/3

Table 4. UFBGA176 ATP3 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 6***
Die 451						Cut 1.0
Preconditioning: moisture sensitivity level 3						
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	231X1	A0/R1		0/231
Temperature Humidity Bias after Preconditioning						
THB	JESD 22-A101	85°c, 85% RH VDD=3v6	77X1	A0/R1 1000h	1000h	0/77
Thermal Cycling after Preconditioning						
TC	JESD 22-A104	-50°c/+150°c	77X1	A0/R1 1000cy	1000cy	0/77
High Temperature Storage Life after Preconditioning						
HTSL	JESD 22-A103	150°c	77X1	A0/R1 1000h	1000h	0/77
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	UFBGA176	3x1	Class 3	250v	0/3

Table 5. LQFP144 ATP1 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 7***
Die 451						Cut 1.0
Preconditioning: moisture sensitivity level 3						
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	231X1	A0/R1		0/308
Temperature Humidity Bias after Preconditioning						
THB	JESD 22-A101	85°c, 85% RH VDD=3v6	77X1	A0/R1 1000h	1000h	0/77
Thermal Cycling after Preconditioning						
TC	JESD 22-A104	-50°c/+150°c	77X1	A0/R1 1000cy	1000cy	0/77
High Temperature Storage Life after Preconditioning						
HTSL	JESD 22-A103	150°c	77X1	A0/R1 1000h	1000h	0/77
Unbiased HAST						
uHAST	JESD 22-A118	130°C, 85%	77X1	A0/R1 1000h	96h	0/77
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	LQFP144	3x1	Class 3	250v	0/3

Table 6. LQFP100 ATP1 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 8***
Die 451						Cut 1.0
Preconditioning: moisture sensitivity level 3						
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	231X1	A0/R1		0/308
Temperature Humidity Bias after Preconditioning						
THB	JESD 22-A101	85°c, 85% RH VDD=3v6	77X1	A0/R1 1000h	1000h	0/77
Thermal Cycling after Preconditioning						
TC	JESD 22-A104	-50°c/+150°c	77X1	A0/R1 1000cy	1000cy	0/77
High Temperature Storage Life after Preconditioning						
HTSL	JESD 22-A103	150°c	77X1	A0/R1 1000h	1000h	0/77
Unbiased HAST						
uHAST	JESD 22-A118	130°C, 85%	77X1	A0/R1 1000h	96h	0/77
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	LQFP144	3x1	Class 3	250v	0/3

Table 7. LQFP176 DSI ASE Taiwan Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 9***
Die 451						Cut 1.0
Preconditioning: moisture sensitivity level 3						
PC	J-STD-020D JESD22-A113	Peak temperature at 260 °C, 3 IR-reflows	231X1	A0/R1		0/308
Temperature Humidity Bias after Preconditioning						
THB	JESD 22-A101	85°c, 85% RH VDD=3v6	77X1	A0/R1 1000h	1000h	0/77
Thermal Cycling after Preconditioning						
TC	JESD 22-A104	-50°c/+150°c	77X1	A0/R1 1000cy	1000cy	0/77
High Temperature Storage Life after Preconditioning						
HTSL	JESD 22-A103	150°c	77X1	A0/R1 1000h	1000h	0/77
Unbiased HAST						
uHAST	JESD 22-A118	130°C, 85%	77X1	A0/R1 1000h	96h	0/77
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	LQFP176 DSI	3x1	Class 3	250v	0/3

Table 8. LQFP176 no DSI ASE Taiwan Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 10***
Die 451						Cut 1.0
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	LQFP176 no DSI	3x1	Class 3	250v	0/3

Table 9. WLCSP180 REGON AMKOR ATT1 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 11***
Die 451						Cut 1.0
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	WLCSP180 REGON	3x1	Class 3	250v	0/3

Table 10. WLCSP180 REGOFF AMKOR ATT1 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 12***
Die 451						Cut 1.0
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	WLCSP180 REGOFF	3x1	Class 3	250v	0/3

Table 11.TFBGA216 no DSI AMKOR ATP3 Package oriented test results

Short description						Results
Descript.	***Test/Method***	***Conditions***	***Sample Size***	***Criteria***	***Read out /Duration***	***Lot 15***
Die 451						Cut 1.1
Electrostatic discharge - Charge Device Model						
CDM	ANSI/ ESD STM 5.3.1	TFBGA216 no DSI	3x1	Class 3	250v	0/3

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-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

5 Glossary

EDR	NVM endurance, data retention and operational life
HTOL	High temperature operating life
HTB	High temperature bake
WEB	Program/Erase endurance cycling + 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
TC	Temperature cycling
UHAST	Unbiased HAST
HTSL	High temperature storage life
ELFR	Early life failure rate

6 REVISION HISTORY

Date	Revision	Changes
04-Janv-16	1	Initial release
26-Janv-16	1.1	TFBGA216 retention1500h
04-Feb-16	1.2	LQFP208 500h/500c, UFBGA176 500h/500c, LQFP144 500h/500c
17-Feb-16	1.3	UFBGA176 1000h/1000c
02-Mar-16	1.4	LQFP100 500h/500c
14-Mar-16	1.5	LQFP100 1000c, LQFP176 DSI 500h/1000c, LQFP176 no DSI CDM
01-Apr-16	1.6	LQFP176 DSI 1000h
26-Apr-16	1.7	WLCSP180 REGON and REGOFF
01-Jun-16	1.8	UFBGA176 1000h
16-Dec-16	1.9	Result of 451XXXZ - PCN9942
11-Jan-17	2.0	change PCN9942 to PCN10029

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