QRFL0014
QUALIFICATION REPORT

M29F002B, M29W022B T6X-U35:
2 Mbit (x8) Single Supply Flash Memory

INTRODUCTION

The M29F002B and M29W022B are 2 Mbit Single Supply (respectively 5V and 3V) Flash memory products with Boot Block partitioning and organized as 256 KByte of 8 bits each. They can be programmed and erased in-system or in standard EPROM programmers.

The M29F002B and M29W022B are manufactured with the STMicroelectronics advanced CMOS 0.35 micron T6X-U35 process, especially developed for Flash memory products. The memory features a fast access time, low power consumption in all operations (Standby, Read, Erase and Program) and an endurance of 100,000 Program/Erase cycles per block.

Qualification Report History

- June 2000: Catania M5 Diffusion Line, TSOP32 (8 x 20mm) package
- June 2000: Catania M5 Diffusion Line, PLCC32 package
- June 2000: Catania M5 Diffusion Line, PDIP32 package

ST recognises that the quality of a product must be built-in during the design, material procurement, manufacturing and testing. Also that the reliability must be demonstrated before the product is released to full mass production. The qualification of new products and the certification of new processes is a rigorous task undertaken by Quality and Reliability professionals, to ensure stable products and processes capable of fully meeting customer requirements.

A key step of this activity is the Design Review where we assure that,

- adequate and realistic product specifications have been developed;
- design and layout rules, as documented in the Design Rules Manual, have been respected;
- critical performance parameters and process variables have been identified;
- previously untested design techniques or manufacturing processes are recognised;
- manufacturability concerns are identified;
- comprehensive and efficient qualification programs are defined.

Product Qualification is made on all new products and on new packages. Qualification is also remade on existing products when there are major changes to the design or manufacturing. The tests performed are tailored to the parameters affected by the major change or the combinations of new die or new package to be evaluated.

The results of the tests for this Flash memory are on the attached pages of this qualification report.

Director of
Memory Products Group
Quality Control & Reliability

Attilio PANCHIERI

Table 1. TSOP32 (8 x 20mm) Plastic Package Related Tests

Sub-group	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Result			Note
				Lots	Samp.	Fail	
1	Phisical Dimensions Coplanarity TSOP32 Package	2016	Published Data Published Data				2 2
2	Bond Strength	2011		1	30	0	
3	Die Attach Strength	2019 or 2027		1	10	0	
4	Radiography	2012		1	45	0	
5	Internal Visual and Mechanical	2014		1	5	0	
6	Solderability TSOP32 Package	2003	215°C, 3 sec, Precondition, 8 hrs, Steam aging				2
7	Resistance to Solvents	2015	4 Solvent Solutions				3
8	Solder Coating Thickness and Compositions	(Note 1)	5 µm min Sn/Pb 85/15				2
9	Resistance to Surface Mounting TSOP32 Package	JEDEC 020A	MSL 3	1	15	0	

Note: 1. According to ST specification.
2. Results for similarity, from standard production monitor.
3. N.A. to laser marking process.

Table 2. TSOP32 (8 x 20mm) Plastic Package - Die Related Tests

Sub-group	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Results			Note
				Lots	Samp.	Fail	
1	Operating Life Test	1005	140°C, V_{CC} = 6V, – 168 hrs – 500 hrs	1	 76 76	 0 0	3
			140°C, V_{CC} = 4V, – 168 hrs – 500 hrs	1	 76 76	 0 0	2,4
2	Low Temperature Operating Life Test	1005	–40°C, V_{CC} = 6V, – 168 hrs – 500 hrs	1	 30 30	 0 0	2,3
			–40°C, V_{CC} = 4V, – 168 hrs – 500 hrs	1	 32 32	 0 0	2,4
3	Retention Bake	1008	150°C – 168 hrs – 500 hrs – 1000 hrs	1	 60 60 60	 0 0 0	3
4	Retention Bake	1008	250°C – 168 hrs – 500 hrs – 1000 hrs	1	 60 60 60	 0 0 0	2,5
			250°C – 168 hrs – 500 hrs	1	 40 40	 0 0	2,4
5	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles	2 1	114 50 50	0 0 0	2,3
			10,000 cycles 50,000 cycles 100,000 cycles	1	64 64 64	0 0 0	2,4
6	Temperature, Humidity, Bias	CECC 90,000	85°C, RH = 85%, V_{CC} = 5.5V, – 168 hrs – 500 hrs – 1000 hrs	1	 60 60 60	 0 0 0	1,3
7	Temperature Cycling	1010C	–65 to 150°C, – 100 cycles – 500 cycles	1	 60 60	 0 0	1,3
8	Pressure Pot		121°C, 2 Atm, RH = 100%, – 96 hrs – 168 hrs – 240 hrs	1	 60 60 60	 0 0 0	1,3

Note: 1. Samples previously submitted to preconditioning flow for surface Mounting devices according to ST specification.
2. Test performed on CDIP48 package.
3. Test performed on M29F002B device.
4. Test performed on M29W022B device.
5. Data applies by similarity from the M29F040B/M29W040B. Results come from the relevant Qualification Report.

Table 3. PLCC32 Plastic Package Related Tests

Sub-group	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Result			Note
				Lots	Samp.	Fail	
1	Phisical Dimensions Coplanarity PLCC32 Package	2016	Published Data Published Data				2 2
2	Bond Strength	2011					2
3	Die Attach Strength	2019 or 2027					2
4	Radiography	2012		1	45	0	
5	Internal Visual and Mechanical	2014		1	5	0	
6	Solderability PLCC32 Package	2003	215°C, 3 sec, Precondition, 8 hrs, Steam aging				2
7	Resistance to Solvents	2015	4 Solvent Solutions				3
8	Solder Coating Thickness and Compositions	(Note 1)	5 µm min Sn/Pb 85/15				2
9	Resistance to Surface Mounting PLCC32 Package	JEDEC 020A	MSL 3	1	15	0	

Note: 1. According to ST specification.
2. Results for similarity, from standard production monitor.
3. N.A. to laser marking process.

Table 4. PLCC32 Plastic Package - Die Related Tests

Sub-group	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Results			Note
				Lots	Samp.	Fail	
1	Operating Life Test	1005	140°C, V_{CC} = 6V, – 168 hrs – 500 hrs – 1000 hrs	1	 60 60 60	 0 0 0	2,3
			140°C, V_{CC} = 4V, – 168 hrs – 500 hrs	1	 76 76	 0 0	2,4
2	Low Temperature Operating Life Test	1005	–40°C, V_{CC} = 6V, – 168 hrs – 500 hrs	1	 30 30	 0 0	2,3
			–40°C, V_{CC} = 4V, – 168 hrs – 500 hrs	1	 32 32	 0 0	2,4
3	Retention Bake	1008	150°C – 168 hrs – 500 hrs – 1000 hrs	 3 2 1	 180 120 60	 0 0 0	3
4	Retention Bake	1008	250°C – 168 hrs – 500 hrs – 1000 hrs	1	 60 60 60	 0 0 0	2,5
			250°C – 168 hrs – 500 hrs	1	 40 40	 0 0	2,4
5	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles	1	50 50 50	0 0 0	2,3
			10,000 cycles 50,000 cycles 100,000 cycles	1	64 64 64	0 0 0	2,4
6	Temperature, Humidity, Bias	CECC 90,000	85°C, RH = 85%, V_{CC} = 5.5V, – 168 hrs – 500 cycles	 2 1	 120 60	 0 0	1,3
7	Temperature Cycling	1010C	–65 to 150°C, – 100 cycles – 500 cycles – 1000 cycles	 3 2 1	 220 160 100	 0 0 0	1,3
8	Pressure Pot		121°C, 2 Atm, RH = 100%, – 96 hrs – 168 hrs – 240 hrs	3	 160 160 160	 0 0 0	1,3

Note: 1. Samples previously submitted to preconditioning flow for surface Mounting devices according to ST specification.
2. Test performed on CDIP48 package.
3. Test performed on M29F002B device.
4. Test performed on M29W022B device.
5. Data applies by similarity from the M29F040B/M29W040B. Results come from the relevant Qualification Report.

Table 5. PDIP32 Plastic Package Related Tests

Sub-group	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Result			Note
				Lots	Samp.	Fail	
1	Phisical Dimensions	2016	Published Data				2
2	Bond Strength	2011					2
3	Die Attach Strength	2019 or 2027					2
4	Radiography	2012		1	45	0	
5	Internal Visual and Mechanical	2014		1	5	0	
6	Solderability PDIP32 Package	2003	215°C, 3 sec, Precondition, 8 hrs, Steam aging				2
7	Resistance to Solvents	2015	4 Solvent Solutions				3
8	Solder Coating Thickness and Compositions	(Note 1)	5 µm min Sn/Pb 85/15				2

Note: 1. According to ST specification.
2. Results for similarity, from standard production monitor.
3. N.A. to laser marking process.

Table 6. PDIP32 Plastic Package - Die Related Tests

Sub-group	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Results			Note
				Lots	Samp.	Fail	
1	Operating Life Test	1005	140°C, V_{CC} = 6V, – 168 hrs – 500 hrs – 1000 hrs	1	 60 60 60	 0 0 0	2,3
			140°C, V_{CC} = 4V, – 168 hrs – 500 hrs	1	 76 76	 0 0	2,4
2	Low Temperature Operating Life Test	1005	–40°C, V_{CC} = 6V, – 168 hrs – 500 hrs	1	 30 30	 0 0	2,3
			–40°C, V_{CC} = 4V, – 168 hrs – 500 hrs	1	 32 32	 0 0	2,4
3	Retention Bake	1008	150°C – 168 hrs – 500 hrs	1	 60 60	 0 0	3
4	Retention Bake	1008	250°C – 168 hrs – 500 hrs – 1000 hrs	1	 60 60 60	 0 0 0	2,5
			250°C – 168 hrs – 500 hrs	1	 40 40	 0 0	2,4
5	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles	1	50 50 50	0 0 0	2,3
			10,000 cycles 50,000 cycles 100,000 cycles	1	64 64 64	0 0 0	2,4
6	Temperature Cycling	1010C	–65 to 150°C, – 100 cycles – 500 cycles	2	 120 120	 0 0	3
7	Pressure Pot		121°C, 2 Atm, RH = 100%, – 96 hrs – 168 hrs – 240 hrs	1	 50 50 50	 0 0 0	3

Note: 1. Samples previously submitted to preconditioning flow for surface Mounting devices according to ST specification.
2. Test performed on CDIP48 package.
3. Test performed on M29F002B device.
4. Test performed on M29W022B device.
5. Data applies by similarity from the M29F040B/M29W040B. Results come from the relevant Qualification Report.

If you have any questions or suggestion concerning the matters raised in this document please send them to the following electronic mail address:

ask.memory@st.com (for general enquiries)

Please remember to include your name, company, location, telephone number and fax number.