SGS-THOMSON MICROELECTRONICS

QUALIFICATION REPORT

M28F102 1 Megabit (64K x 16) CMOS T5-U20 FLASH MEMORY in TSOP40 and PLCC44

INTRODUCTION

The M28F102 is a 1 Megabit FLASH Memory organised as 64K x 16 bits. It is manufactured in the SGS-THOMSON Advanced CMOS 0.8 micron T5-U20 (-20% upgrade) process which has been expecially developed for flash memory products. The memory features a fast 100ns access time, very low standby power consumption of 100µA at 5V, an endurance of 10,000 Erase/Program cycles and an integrated Erase/Program Stop timer.

The qualification tests of this program have been perfomed on devices assembled in surface mounting TSOP40 (10 x 14mm) and PLCC44 packages.

Additional reliability tests to qualify the TSOP40 package have been performed on the previous die version and are presented in Table 2.

SGS-THOMSON 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 to the combinations of new die or new package to be evaluated.

The results of the tests for the M28F102 FLASH MEMORY are on the attached pages of this qualification report. Additional reliability tests to qualify the process have been performed on the M28F101. Results are detailed in the qualification report QR104/1194.

Director of
Memory Products Group
Quality Control & Reliability

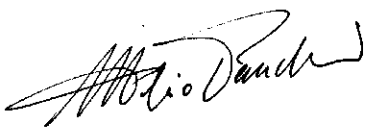

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Table 1. Product Qualification, Plastic Package Related Tests
M28F102, TSOP40 (10 x 14mm), CMOS T5-U20

Subgroup	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Result			Note
				Lots	Samp.	Fail	
1	Physical Dimensions	2016	Published Data	2	10	0	
	Coplanarity TSOP40 Package		Published Data	2	10	0	
2	Bond Strength	2011		2	10	0	
3	Die Attach Strength	2019 or 2027		2	2	0	
4	Radiography	2012		2	90	0	
5	Internal Visual and Mechanical	2014		2	10	0	
6	Solderability TSOP40 Package	2003	215°C, 3 sec, Precondition, 8 hrs, Steam aging	2	5	0	
7	Resistance to Solvents	2015	4 Solvent Solutions	2	20	0	
8	Solder Coating Thickness and Compositions	(Note 1)	5µm min Sn/Pb 85/15	2	10	0	
9	Resistance to Surface Mounting TSOP40 Package:	(Note 1)					
	1. Temperature Cycling		–40 to 150°C, 20 cycles				2
	2. Drying		125°C, 24 hrs				2
	3. Temperature, Humidity Exposure		30°C, RH = 60%, 168 hrs				2, 3
	4. 3 IR Cycles Exposure		T_{PEAK} = 235°C ± 5°C				2
	5. Visual Inspection		40 x				4
	6. Delamination Inspection by Acoustic Microscopy (SAM)						4
	7. Electrical Test						2
	8. Reliability Test		See Table 2 and 3				2

Notes: 1. According to SGS-THOMSON specification
2. For samples and Results refer to Table 2 and 3.
3. Or equivalent conditions for package moisture absorption.
4. Sample basis.

Table 2. Product Qualification, Plastic Packages - Die Related Tests
M28F102, TSOP40 (10 x 14mm), CMOS T5

Subgroup	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Results			Note
				Lots	Samp.	Fail	
1	Operating Life Test	1005	140°C, V_{CC} = 7V, – 168 hrs – 500 hrs – 1000 hrs		 228 228 228	 0 0 0	1, 2
2	Retention Bake	1008	150°C, – 168 hrs – 500 hrs – 1000 hrs		 180 180 180	 0 0 0	1
3	Write/Erase Cycling		10,000 cycles 20,000 cycles		61 61	0 0	
4	Temperature, Humidity, Bias	CECC 90,000	85°C, RH = 85%, V_{CC} = 5V, – 168 hrs – 500 hrs – 1000 hrs		 180 180 180	 0 0 0	1, 2
5	Temperature Cycling	1010	–65 to 150°C, – 100 cycles – 500 cycles – 1000 cycles		 180 180 180	 0 0 0	1, 2
6	Thermal Shock	1011	–55 to 125°C, – 100 cycles – 500 cycles		 75 75	 0 0	1, 2
7	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		 210 210 210	 0 0 0	1
8	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		 234 234 234	 0 0 0	1, 2
9	HAST	CECC 90,000	130°C, RH = 85%, 5,5V – 48 hrs – 96hrs – 168 hrs		 75 75 75	 0 0 0	1, 2

Notes: 1. Sample is coming from 3 different lots minimum.
2. Samples previously submitted to preconditioning flow for Surface Mounting devices according to SGS-THOMSON specification.

Table 3. Product Qualification, Plastic Packages - Die Related Tests
M28F102, TSOP40 (10 x 14mm), CMOS T5-U20

Subgroup	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Results			Note
				Lots	Samp.	Fail	
1	Operating Life Test	1005	140°C, V_{CC} = 7V, – 168 hrs – 500 hrs – 1000 hrs		 74 74 74	 0 0 0	1, 4
2	Retention Bake	1008	250°C, – 168 hrs – 500 hrs		 50 50	 0 0	2
3	Retention Bake	1008	150°C, – 168 hrs – 500 hrs – 1000 hrs		 60 60 60	 0 0 0	1
4	Retention Bake (after 10k cycles)	1008	250°C, – 168 hrs		 100	 0	5
5	Write/Erase Cycling		10,000 cycles 20,000 cycles 50,000 cycles		100 100 32	0 0 0	1, 3, 5
6	Temperature, Humidity, Bias	CECC 90,000	85°C, RH = 85%, V_{CC} = 5V, – 168 hrs – 500 hrs – 1000 hrs		 60 60 60	 0 0 0	1, 4
7	Temperature Cycling	1010	–65 to 150°C, – 100 cycles – 500 cycles – 1000 cycles		 60 60 60	 0 0 0	1, 4
8	Thermal Shock	1011	–55 to 125°C, – 100 cycles – 500 cycles		 25 25	 0 0	1, 4
9	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		 60 60 60	 0 0 0	4

Notes: 1. Sample is coming from 1 lot.
2. Test performed on FDIP32W package.
3. Data collection in progress.
4. Samples previously submitted to preconditioning flow for Surface Mounting devices according to SGS-THOMSON specification.
5. Sample is coming from 3 different lots.

Table 4. Product Qualification, Plastic Packages - Die Related Tests
M28F102, PLCC44, CMOS T5-U20

Subgroup	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Results			Note
				Lots	Samp.	Fail	
1	Temperature, Humidity, Bias	CECC 90,000	85°C, RH = 85%, V_{CC} = 5V, – 168 hrs – 500 hrs – 1000 hrs		 60 60 60	 0 0 0	1, 2
2	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		 60 60 60	 0 0 0	1, 2

Notes: 1. Sample is coming from 1 lot.
2. Samples previously submitted to preconditioning flow for Surface Mounting devices according to SGS-THOMSON specification.