

**M28F210/220, 2Mbit (x16) and M28F211/221, 2 Megabit (x8)
FLASH MEMORY in SO44 TSOP48 and TSOP40**

INTRODUCTION

The M28F210/220 is a 2Megabit FLASH Memory Boot Block Dual Power Supply (5/12V) organised as 256Kx8 bits or 128Kx16 bits. The M28F211/221 is a 2 Megabit FLASH Memory Boot Block Dual Power Supply (5/12V) organised as 256Kx8 bits. They are manufactured in the SGS-THOMSON Advanced CMOS 0.6 micron T6 process which has been especially developed for flash memory products. The memories feature a fast 70ns access time, very low standby power consumption of 60µA at 5V, an endurance of 100,000 Erase/Program cycles and an integrated Erase/Program Stop timer.

The M28F210/220 are proposed in both SO44 and TSOP48 packages, and M28F211/221 are proposed in TSOP40 package. Both of them feature the Boot Block Architecture. The Boot Block is located at either the top (in M28F210/211) or the bottom (in M28F220/221) of the address map. This capability is in order to accommodate different microprocessor protocols for boot code location.

The qualification tests of this program have been performed on devices assembled in surface mounting:

- M28F210 in SO44 package.
- M28F220 in TSOP48 (12x20mm) package.
- M28F211 in TSOP40 (10x20mm) package.

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.

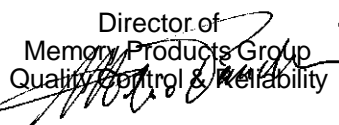
A key step of this activity is the Design Review where we assure that,

- 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 mayor change or the combinations of new die or new package to be evaluated.

The results of the tests for the M28F210, M28F220 and M28F211 FLASH Memory are on the attached pages of this qualification report.

Director of
Memory Products Group
Quality Control & Reliability



**Table 1. Product Qualification, Plastic Package Related Tests
M28F210, SO44, CMOS T6**

Subgroup	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Result			Note
				Lots	Samp.	Fail	
1	Physical Dimensions	2016	Published Data	1	5	0	
	Coplanarity SO44 Package		Published Data	1	5	0	
2	Bond Strength	2011		1	220 wires	0	
3	Die Attach Strength	2019 or 2027		1	9	0	
4	Radiography	2012		1	45	0	
5	Internal Visual and Mechanical	2014		1	5	0	
6	Solderability SO44 Package	2003	215°C, 3 sec, Precondition, 8 hrs, Steam aging	1	30	0	
7	Resistance to Solvents	2015	4 Solvent Solutions	1	5	0	
8	Solder Coating Thickness and Compositions	(Note 1)	5µm min Sn/Pb 85/15	1	10	0	
9	Resistance to Surface Mounting SO44 Package:	(Note 1)					
	1. Drying		125°C, 24 hrs				2
	2. Temperature, Humidity Exposure		30°C, RH = 60%, 168 hrs				2,3
	3. 3 IR Cycles Exposure		T _{PEAK} = 235°C ± 5°C				2
	4. Visual Inspection		40 x				4
	5. Delamination Inspection by Acoustic Microscopy (SAM)						4
6. Electrical Test						2	

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

**Table 2. Product Qualification, Plastic Package Related Tests
M28F220, TSOP48 (12 x 20mm), CMOS T6**

Subgroup	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Result			Note
				Lots	Samp.	Fail	
1	Physical Dimensions	2016	Published Data	1	5	0	
	Coplanarity TSOP48 Package		Published Data	1	5	0	
2	Bond Strength	2011		4	180 wires	0	
3	Die Attach Strength	2019 or 2027		4	8	0	
4	Radiography	2012		3	135	0	
5	Internal Visual and Mechanical	2014		3	15	0	
6	Solderability TSOP48 Package	2003	215°C, 3 sec, Precondition, 8 hrs, Steam aging	4	20	0	
7	Resistance to Solvents	2015	4 Solvent Solutions	1	5	0	
8	Solder Coating Thickness and Compositions	(Note 1)	5µm min Sn/Pb 85/15	1	20	0	
9	Resistance to Surface Mounting TSOP48 Package:	(Note 1)					
	1. Drying		125°C, 24 hrs				2
	2. Temperature, Humidity Exposure		30°C, RH = 60%, 192 hrs				2,3
	3. 3 IR Cycles Exposure		T _{PEAK} = 235°C ± 5°C				2
	4. Visual Inspection		40 x				4
	5. Delamination Inspection by Acoustic Microscopy (SAM)						4
6. Electrical Test						2	

Notes: 1. According to SGS-THOMSON specification
 2. For samples and Results refer to Table 5.
 3. Or equivalent conditions for package moisture absorption.
 4. Sample basis.

**Table 3. Product Qualification, Plastic Package Related Tests
M28F211, TSOP40 (10 x 20mm), CMOS T6**

Subgroup	Test Procedure	MIL-STD-883 Procedure	Test Conditions	Result			Note
				Lots	Samp.	Fail	
1	Physical Dimensions	2016	Published Data	1	5	0	
	Coplanarity TSOP40 Package		Published Data	1	5	0	
2	Bond Strength	2011		4	180 wires	0	
3	Die Attach Strength	2019 or 2027		4	8	0	
4	Radiography	2012		3	135	0	
5	Internal Visual and Mechanical	2014		3	15	0	
6	Solderability TSOP40 Package	2003	215°C, 3 sec, Precondition, 8 hrs, Steam aging	4	20	0	
7	Resistance to Solvents	2015	4 Solvent Solutions	1	5	0	
8	Solder Coating Thickness and Compositions	(Note 1)	5µm min Sn/Pb 85/15	1	20	0	
9	Resistance to Surface Mounting TSOP40 Package:	(Note 1)					
	1. Drying		125°C, 24 hrs				2
	2. Temperature, Humidity Exposure		30°C, RH = 60%, 192 hrs				2,3
	3. 3 IR Cycles Exposure		T _{PEAK} = 235°C ± 5°C				2
	4. Visual Inspection		40 x				4
	5. Delamination Inspection by Acoustic Microscopy (SAM)						4
6. Electrical Test						2	

Notes: 1. According to SGS-THOMSON specification
 2. For samples and Results refer to Table 6.
 3. Or equivalent conditions for package moisture absorption.
 4. Sample basis.

**Table 4. Product Qualification, Plastic Packages - Die Related Tests
M28F210, SO44, CMOS T6**

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		65 65 65	0 0 0	1,5,6
2	Retention Bake	1008	250°C, – 168 hrs – 500 hrs – 1000 hrs		173 173 173	0 0 0	1,2
3	Retention Bake	1008	150°C, – 168 hrs – 500 hrs – 1000 hrs		60 60 60	0 0 0	6
4	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles		150 100 50	0 0 0	1,3
5	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	5,6
6	Temperature Cycling	1010	–65 to 150°C, – 500 cycles – 1000 cycles		60 60	0 0	5,6
7	Thermal Shock	1011	–55 to 125°C, – 200 cycles – 500 cycles		25 25	0 0	5,6
8	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		180 180 180	0 0 0	1,5
9	HAST	CECC 90,000	130°C, RH = 85%, 5,5V – 48 hrs – 96hrs – 168 hrs		21 21 21	0 0 0	5,6

- Notes:** 1. Sample is coming from 3 different lots minimum.
2. Test performed on FDIP32W package.
3. Data collection in progress.
4. Test not performed.
5. Samples previously submitted to preconditioning flow for Surface Mounting devices according to SGS-THOMSON specification.
6. Samples coming from 1 lot.

**Table 5. Product Qualification, Plastic Packages - Die Related Tests
M28F220, TSOP48 (12 x 20mm), CMOS T6**

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	Retention Bake	1008	150°C, – 168 hrs – 500 hrs – 1000 hrs		120 120 120	0 0 0	1
3	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles				2
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
5	Temperature Cycling	1010	–65 to 150°C, – 500 cycles – 1000 cycles		180 180	0 0	1
6	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		177 177 177	0 0 0	1,3
7	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		177 177 177	0 0 0	1
8	HAST	CECC 90,000	130°C, RH = 85%, 5,5V – 48 hrs – 96 hrs – 168 hrs – 240 hrs		75 75 75 75	0 0 0 0	1

Notes: 1. Sample is coming from 3 different assy lots minimum.
 2. For samples and results refer to Table 4.
 3. Samples previously submitted to preconditioning flow for Surface Mounting devices according to SGS-THOMSON specification.

**Table 6. Product Qualification, Plastic Packages - Die Related Tests
M28F211, TSOP40 (10 x 20mm), CMOS T6**

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		76 76 76	0 0 0	1,2
2	Retention Bake	1008	150°C, – 168 hrs – 500 hrs – 1000 hrs		60 60 60	0 0 0	1
3	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles		64 64	0 0	1,4
4	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
5	Temperature Cycling	1010	–65 to 150°C, – 100 cycles – 500 cycles – 1000 cycles		60 60 60	0 0 0	1,2
6	Thermal Shock	1011	–55 to 125°C, – 100 cycles – 500 cycles		25 25	0 0	1,2
7	HAST	CECC 90,000	130°C, RH = 85%, 5,5V – 48 hrs – 96 hrs – 168 hrs – 240 hrs		24 24 24 24	0 0 0 0	1,2
8	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		178 178 178	0 0 0	1,2,3

Notes: 1. Samples coming from 1 lot.
2. Samples previously submitted to preconditioning flow for Surface Mounting devices according to SGS-THOMSON specification.
3. Samples are coming from 3 different lots minimum.
4. Data collection in progress.

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