

**M28F410/420, M28F411/421 4 Megabit (x16) and (x8)
FLASH MEMORY in SO44 and TSOP40**

INTRODUCTION

The M28F410/420 is a 4Megabit FLASH Memory Boot Block Dual Power Supply (5/12V) organised as 512Kx8 bits or 256Kx16 bits. The M28F411/421 is a 4 Megabit FLASH Memory Boot Block Dual Power Supply (5/12V) organised as 512Kx8 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 100ns access time, very low standby power consumption of 100µA at 5V, an endurance of 100,000 Erase/Program cycles and an integrated Erase/Program Stop timer.

The M28F410/420 and M28F411/421 feature the Boot Block Architecture. The Boot Block is located at either the top (in M28F410/411) or the bottom (in M28F420/421) 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 SO44 and TSOP40 (10x20mm) packages.

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 M28F410 and M28F411 FLASH Memory are on the attached pages of this qualification report.

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**Table 1. Product Qualification, Plastic Package Related Tests
M28F410, 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. 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 3				2		

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

**Table 2. Product Qualification, Plastic Package Related Tests
M28F411, 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		1	45	0	
5	Internal Visual and Mechanical	2014		1	5	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. 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 4				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 3. Product Qualification, Plastic Packages - Die Related Tests
M28F410, 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		225 225 225	0 0 0	1, 5
2	Retention Bake	1008	250°C, – 168 hrs – 500 hrs		320 320	0 0	2
3	Retention Bake	1008	150°C, – 168 hrs – 500 hrs – 1000 hrs		120 120 120	0 0 0	1
4	Retention Bake (after 10k cycles)	1008	250°C, – 168 hrs		503	0	
5	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles		503 219 83	0 0 0	1, 3
6	Temperature, Humidity, Bias	CECC 90,000	85°C, RH = 85%, V _{CC} = 5V, – 168 hrs – 500 hrs – 1000 hrs		221 221 221	0 0 0	1, 5
7	Temperature Cycling	1010	–65 to 150°C, – 500 cycles – 1000 cycles		182 182	0 0	1, 5
8	Thermal Shock	1011	–55 to 125°C, – 100 cycles – 500 cycles		72 72	0 0	1, 5
9	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		272 272 272	0 0 0	5
10	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		97 97 97	0 0 0	
11	HAST	CECC 90,000	130°C, RH = 85%, 5,5V – 48 hrs – 96hrs		40 40	0 0	5
12	Electrostatic Discharge	3015	1500Ω, 100pF, 1000V		36	0	
13	Electrostatic Discharge	EIAJ IC-121	0Ω, 200pF, 200V (min)				4
14	Latch-up	JEDEC STD-17	Current Injection 200mA (min), Overvoltage 14V/500mA (min)		45	0	

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.

**Table 4. Product Qualification, Plastic Packages - Die Related Tests
M28F411, 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		61 61 61	0 0 0	1
3	Write/Erase Cycling		10,000 cycles 50,000 cycles 100,000 cycles				3
4	Temperature, Humidity, Bias	CECC 90,000	85°C, RH = 85%, V _{CC} = 5V, – 168 hrs – 500 hrs – 1000 hrs		80 80 80	0 0 0	1, 2
5	Temperature Cycling	1010	–65 to 150°C, – 100 cycles – 500 cycles – 1000 cycles		70 70 70	0 0 0	1, 2
6	Thermal Shock	1011	–55 to 125°C, – 100 cycles – 500 cycles		26 26	0 0	1, 2
7	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		78 78 78	0 0 0	1
8	Pressure Pot		121°C, 2 Atm, – 96 hrs – 168 hrs – 240 hrs		80 80 80	0 0 0	1, 2

- Notes:** 1. Sample is coming from 1 lot due to the fact that the package has been already qualified with another die version. Refer to the Qualification Report "QR105/1294".
2. Samples previously submitted to preconditioning flow for Surface Mounting devices according to SGS-THOMSON specification.
3. Test not performed on this die version. Test covered by results obtained on M28F410 die.

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