

Cypress Semiconductor Reliability Qualification Report

QTP# Q100773 Version **

S25FL164K MaskSet 4.0

Qualification of S25FL164K, 64 M-Bit CMOS 3.0-Volt Flash Non-Volatile Memory Serial Peripheral Interface (SPI) with Multi-I/O in SOC008 (8.00 x 5.28 x 2.159mm) 8 Lead, Small Outline Integrated Circuit (SOIC)

**FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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I. Product and Package Information

Product Description: S25FL164K **Cypress Division:** Memory Product Division
64 M-Bit CMOS 3.0-Volt Flash Non-Volatile Memory Serial Peripheral Interface (SPI) with Multi-I/O

Package: SOC008	QTP: Q100773	
Description: (8.00 x 5.28 x 2.159mm) 8 Lead, Small Outline Integrated Circuit (SOIC)		Flammability: O2 Index:
Assembly: ZKT China	Molding Compound: Samsung SG8300HKT	UL-V0 >28
Electrical Test: Cypress Thailand	Theta Ja / Psi Jt: 75 °C/W / 1 °C/W	
Substrate/Leadframe: Copper Leadframe	Die Attachment: Yizbond 8511	
Lead Finish: 100% Matte Sn Plating	Bond Wire: Copper	
Comments:		

Est. Field Temperature: 55 °C	Life Test Temperature: 150 °C
Est. DC Field Current: 25 mA	Life Test Dynamic Current: 20 mA
Est. Field Voltage: 3.0 V	Life Test Voltage: 3.6 V
Est. Field Power Dissipation: 75 mWatts	Est. Stress Power Dissipation: 72 mWatts
Est. Field Tj: 60.6 °C	Est. Stress Tj: 155.4 °C

Die: 98RZ5A	Die Size: 2.72 x 3.70 mm
Process: 90nm	Fab: XMC
Type: Floating Gate	Density: 64M

II. 90nm Floating Gate Life Test Failure Rate Calculation

HTOL Stress Temperature - 150 °C

Failure Mechanism	Read Points / Test Results				Modeling Parameters @ 55°C					Avg. Failure Rate FITS @ 55°C, 60% Conf.	
	24 hrs	48 hrs	168 hrs	1000 hrs	Ea eV	TAF	VAF	OAF	MTTF (yrs)	PPM	FIT
PLASTIC											
Sample Size	4600	600	5194	1320							
Zero fails, Process ave. Ea	0	0	0	0	0.7	208	1	208			
Totals	0	0	0	0					38052	0	3

* Contributes to early life FITS

Data Retention Bake - 150 °C

Reliability Stress	Number of Rejects	Sample Size	Failure Rate %	Failure Mechanism
500 hrs	0	924	0.00	No Failures
1000 hrs	0	1000	0.00	No Failures

III. Summary of Stress Test Results

Stress Test	Stress Condition	Package Type	Sample Size	Num. of Lots	Num. of Fails	Failure Rate %	Comments
Data From Qualification Q100773:							
HTOL (EL)	(3.6V, 150°C)	SOC008 ¹	77	1	0	0.00	168 hours
ESD CDM	N/A	SOC008 ¹	15	1	Passed	1.0kV	
ESD HBM	N/A	SOC008 ¹	15	1	Pass	2kV	
Latch Up	(+/- 100mA)	SOC008 ¹	6	1	Passed		
Endurance (10k)	(105°C, 3.6V)	SOC008 ¹	64	1	0	0.00	10k cycles
	(25°C, 3.6V)	SOC008 ¹	64	1	0	0.00	10k cycles
	(-40°C, 3.6V)	SOC008 ¹	64	1	0	0.00	10k cycles
Generic Reference Data:							
HTOL (EL)	(3.6V, 125°C)	SOC008 ³	77	1	0	0.00	168 hours
HTOL (XL)	(3.6V, 125°C)	SOC008 ³	77	1	0	0.00	1000 hours
Data Retention Bake	(150°C)	SOC008 ²	77	1	0	0.00	1000 hours
Endurance (10k)	(105°C, 3.6V)	SOC008 ²	63	2	0	0.00	10k cycles
	(-40°C, 3.6V)	SOC008 ²	64	2	0	0.00	10k cycles
	(125°C, 3.6V)	SOC008 ³	64	1	0	0.00	10k cycles
	(-40°C, 3.6V)	SOC008 ³	64	1	0	0.00	10k cycles
Endurance (100k)	(105°C, 3.6V)	SOC008 ²	62	2	0	0.00	100k cycles
	(90°C, 3.6V)	SOC008 ²	63	2	0	0.00	100k cycles
	(125°C, 3.6V)	SOC008 ³	64	1	0	0.00	100k cycles
Preconditioning	(PC9/260°C, +0°C/-5°C)	SOC008 ²	226	1	Passed	Jedec L3 / Jeita Rank E	
	(PC9/260°C, +0°C/-5°C)	SOC008 ³	182	3	Passed	Jedec L3 / Jeita Rank E (A	
	(PC9/260°C, +0°C/-5°C)	SOC008 ⁴	231	1	Passed	Jedec L3 / Jeita Rank E (A	
Precon+Temp Cycle	(PC9/260°C, -40°C/150°C)	SOC008 ²	72	1	0	0.00	1000 cycles
	(PC9/260°C, -40°C/150°C)	SOC008 ³	77	1	0	0.00	1000 cycles
	(PC9/260°C, -40°C/150°C)	SOC008 ⁴	72	1	0	0.00	1000 cycles
Precon+HAST	(PC9/260°C, Biased, 130°C/85% RH)	SOC008 ²	77	1	0	0.00	96 hours
	(PC9/260°C, Biased, 130°C/85% RH)	SOC008 ³	28	1	0	0.00	96 hours
	(PC9/260°C, Biased, 130°C/85% RH)	SOC008 ⁴	77	1	0	0.00	96 hours
Precon+uHAST	(PC9/260°C, Unbiased, 130°C/85% RH)	SOC008 ²	77	1	0	0.00	96 hours
	(PC9/260°C, Unbiased, 130°C/85% RH)	SOC008 ³	77	1	0	0.00	96 hours
	(PC9/260°C, Unbiased, 130°C/85% RH)	SOC008 ⁴	77	1	0	0.00	96 hours

- Notes / Justification:**
- 1) Results from Qual Q100773, S25FL164K, 90nm Floating Gate in 8 Lead SOIC (8 x 5.28 x 2.159mm)
 - 2) Results from Qual Q100547, S25FL164K in 8 Lead SOIC (8 x 5.28 x 2.159mm) - Same Device, Same Package and Same Assembly location
 - 3) Results from Qual Q100622, S25FL164K in 8 Lead SOIC (8 x 5.28 x 2.159mm) - Same Device, Same Package and Same Assembly location
 - 4) Results from Qual Q100457, S25FL164K in 8 Lead SOIC (8 x 5.28 x 2.159mm) - Same Device, Same Package and Same Assembly location

Preconditioning Flows: PC9 (Accelerated JEDEC L3 / JEITA Rank E): Bake 125°C, 24hr => Soak @ 60°C/70%RH, 72hr => 3x Reflow

Reliability Tests Performed per Specification Requirements

Stress	Condition	Specification Reference
Data Retention Bake	(150°C)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (100k)	(105°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (100k)	(125°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (100k)	(90°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (10k)	(105°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (10k)	(125°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (10k)	(25°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (10k)	(-40°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
ESD CDM	N/A	JS002 / AEC-Q100-011
ESD HBM	N/A	JS001 / AEC-Q100-002
HTOL (EL)	(3.6V, 125°C)	JESD22-A108
HTOL (EL)	(3.6V, 150°C)	JESD22-A108
HTOL (XL)	(3.6V, 125°C)	JESD22-A108
Latch Up	(+/- 100mA)	JESD78 / AEC Q100-004
Precon+HAST	(PC9/260°C, Biased, 130°C/85% RH)	JESD22-A110
Precon+Temp Cycle	(PC9/260°C, -40°C/150°C)	JESD22-A104
Precon+uHAST	(PC9/260°C, Unbiased, 130°C/85% RH)	JESD22-A118
Preconditioning	(PC9/260°C, +0°C/-5°C)	J-STD-020 / EIAJ ED-4701-100 Method 104

IV. Revision History

Document Number: 002-21610**Document Title:** Q100773 : Qualification of S25FL164K with MaskSet 4.0

Rev.	Issue Date	ECN#	Originator	Description
**	10/4/2017	5907773	EKNG	Initial Release.

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