Cypress Semiconductor
Reliability Qualification Report

QTP# 162018 Version *D

S25FL256L

Qualification of: S25FL256L, 256 Megabit, 3.0-Volt Single Supply Serial Peripheral Interface Flash Non-Volatile Memory with Multi-I/O

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

Product Description: S25FL256L
256 Megabit, 3.0-Volt Single Supply Serial Peripheral Interface
Flash Non-Volatile Memory with Multi-I/O

Cypress Division: Memory Product Division

Package: SO3016 **QTP:** 162018

Description: (10.3 x 10.3 x 2.65mm) 16 Lead, Small Outline Integrated Circuit (SOIC)

Flammability: UL-V0 **O2 Index:** >28

Assembly: ASE Chung-Li **Molding Compound:** Hitachi CEL 9240

Electrical Test: Cypress Thailand

Substrate/Leadframe: Copper Leadframe **Die Attachment:** Hitachi EN-4900

Lead Finish: 100% Matte Sn Plating

Comments:

Est. Field Temperature:	55	°C	**Life Test Temperature:**	150	°C
Est. DC Field Current:	25	mA	**Life Test Dynamic Current:**	10	mA
Est. Field Voltage:	3.0	V	**Life Test Voltage:**	3.6	V
Est. Field Power Dissipation:	75	mWatts	**Est. Stress Power Dissipation:**	36	mWatts

Die:	98TZ1A	**Die Size:**	4.35 x 5.32 mm
Process:	65nm	**Fab:**	XMC
Type:	Floating Gate	**Density:**	256M

I.B. Product and Package Information

Product Description:	S25FL256L 256 Megabit, 3.0-Volt Single Supply Serial Peripheral Interface Flash Non-Volatile Memory with Multi-I/O	**Cypress Division:**	Memory Product Division

Package:	WNG008	**QTP:**	162001		
Description:	(6 x 8 x 0.8mm) 8 Contact, Small Outline No Lead Package (WSON)			**Flammability:**	**O2 Index:**
Assembly:	ASE Chung-Li	**Molding Compound:**	Sumitomo EME G700LA	UL-V0	>28
Electrical Test:	Cypress Thailand				
Substrate/Leadframe:	Copper Leadframe	**Die Attachment:**	ATB125		
Lead Finish:	100% Matte Sn Plating				
Comments:					

Est. Field Temperature:	55	°C	**Life Test Temperature:**	150	°C
Est. DC Field Current:	25	mA	**Life Test Dynamic Current:**	10	mA
Est. Field Voltage:	3.0	V	**Life Test Voltage:**	3.6	V
Est. Field Power Dissipation:	75	mWatts	**Est. Stress Power Dissipation:**	36	mWatts

Die:	98TZ1A	**Die Size:**	4.35 x 5.32 mm
Process:	65nm	**Fab:**	XMC
Type:	Floating Gate	**Density:**	256M

I.C. Product and Package Information

Product Description: S25FL256L
256 Megabit, 3.0-Volt Single Supply Serial Peripheral Interface
Flash Non-Volatile Memory with Multi-I/O

Cypress Division: Memory Product Division

Package: FAB024
QTP: 162020
Description: (8 x 6 x 1.2mm) 24 Ball, Fine Pitch Ball Grid Array Package (FBGA)
Assembly: Cypress Thailand
Molding Compound: ShinEtsu KMC 3580LVA
Flammability: UL-V0
O2 Index: >28
Electrical Test: Cypress Thailand
Substrate/Leadframe: Laminate Substrate
Die Attachment: CRM-1577DB
Lead Finish: 96.5Sn3.0Ag0.5Cu Spheres
Comments:

Est. Field Temperature: 55 °C
Est. DC Field Current: 25 mA
Est. Field Voltage: 3.0 V
Est. Field Power Dissipation: 75 mWatts

Life Test Temperature: 150 °C
Life Test Dynamic Current: 10 mA
Life Test Voltage: 3.6 V
Est. Stress Power Dissipation: 36 mWatts

Die: 98TZ1A
Process: 65nm
Type: Floating Gate

Die Size: 4.35 x 5.32 mm
Fab: XMC
Density: 256M

I.D. Product and Package Information

Product Description: S25FL256L
256 Megabit, 3.0-Volt Single Supply Serial Peripheral Interface Flash Non-Volatile Memory with Multi-I/O

Cypress Division: Memory Product Division

Package: FAC024

QTP: 162019

Description: (8 x 6 x 1.2mm) 24 Ball, Fine Pitch Ball Grid Array Package (FBGA)

Flammability: UL-V0

O2 Index: >28

Assembly: Cypress Thailand

Molding Compound: ShinEtsu KMC 3580LVA

Electrical Test: Cypress Thailand

Substrate/Leadframe: Laminate Substrate

Die Attachment: CRM-1577DB

Lead Finish: 96.5Sn3.0Ag0.5Cu Spheres

Comments:

Est. Field Temperature:	55	°C	**Life Test Temperature:**	150	°C
Est. DC Field Current:	25	mA	**Life Test Dynamic Current:**	10	mA
Est. Field Voltage:	3.0	V	**Life Test Voltage:**	3.6	V
Est. Field Power Dissipation:	75	mWatts	**Est. Stress Power Dissipation:**	36	mWatts

Die:	98TZ1A	**Die Size:**	4.35 x 5.32 mm
Process:	65nm	**Fab:**	XMC
Type:	Floating Gate	**Density:**	256M

I.E. Product and Package Information

Product Description: S25FL256L
256 Megabit, 3.0-Volt Single Supply Serial Peripheral Interface
Flash Non-Volatile Memory with Multi-I/O

Cypress Division: Memory Product Division

Package: WNG008 **QTP:** 162704

Description: (6 x 8 x 0.8mm) 8 Contact, Small Outline No Lead Package (WSON)

Assembly: UTL Thailand

Molding Compound: Sumitomo EME G770HCD

Flammability: UL-V0 **O2 Index:** >28

Electrical Test: Cypress Thailand

Substrate/Leadframe: Copper Leadframe

Die Attachment: Ablestik 8200T

Lead Finish: 100% Matte Sn Plating

Comments:

Est. Field Temperature:	55	°C	**Life Test Temperature:**	150	°C
Est. DC Field Current:	25	mA	**Life Test Dynamic Current:**	10	mA
Est. Field Voltage:	3.0	V	**Life Test Voltage:**	3.6	V
Est. Field Power Dissipation:	75	mWatts	**Est. Stress Power Dissipation:**	36	mWatts

Die:	98TZ1A	**Die Size:**	4.35 x 5.32 mm
Process:	65nm	**Fab:**	XMC
Type:	Floating Gate	**Density:**	256M

II. 65nm 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	168 hrs	500 hrs	1000 hrs	Ea eV	TAF	VAF	OAF	MTTF (yrs)	PPM	FIT
PLASTIC											
Sample Size	3358	1758	730	730							
Zero fails, Process ave. Ea	0 *	0	0	0	0.7	141	1	141			
Totals	**0**	**0**	**0**	**0**					**28539**	**0**	**4**

* Contributes to early life FITS

Data Retention Bake - 150 °C

Reliability Stress	Number of Rejects	Sample Size	Failure Rate %	Failure Mechanism
500 hrs	0	229	0.00	No Failures
1000 hrs	0	229	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 162018, 162001, 162020, 162019, 162704:							
HTOL (EL)	(3.6V, 150°C)	SO3016 [1]	1600	2	0	0.00	48 hours
	(3.6V, 150°C)	SO3016 [1]	797	1	0	0.00	168 hours
	(3.6V, 150°C)	FAB024 [3]	268	3	0	0.00	168 hours
HTOL (IL)	(3.6V, 150°C)	SO3016 [1]	231	3	0	0.00	1000 hours
	(3.6V, 150°C)	FAB024 [3]	268	3	0	0.00	500 hours
HTOL (XL)	(3.6V, 150°C)	FAB024 [3]	268	3	0	0.00	1000 hours
High Temp Bake	(200°C)	SO3016 [1]	77	1	0	0.00	350 hours
	(200°C)	FAB024 [3]	72	1	0	0.00	350 hours
	(150°C)	FAB024 [3]	231	3	0	0.00	1000 hours
ESD CDM	N/A	SO3016 [1]	45	3	Passed 1.0kV		
	N/A	WNG008 [2]	15	1	Passed 1.0kV		
	N/A	FAB024 [3]	45	3	Passed 1.0kV		
	N/A	FAC024 [4]	15	1	Passed 1.0kV		
	N/A	WNG008 [5]	15	1	Passed 1.0kV		
ESD HBM	(100pF, 1500 Ohms)	SO3016 [1]	180	3	Passed 2.0kV		
Endurance (100k)	(125°C, 3.6V)	SO3016 [1]	190	3	0	0.00	100k cycles
	(25°C, 3.6V)	SO3016 [1]	64	1	0	0.00	100k cycles
	(-40°C, 3.6V)	SO3016 [1]	63	1	0	0.00	100k cycles
Preconditioning	(PC2/260°C, +0°C/-5°C)	WNG008 [2]	77	1	Passed Jedec L3		
	(PC1/260°C, +0°C/-5°C)	FAB024 [3]	770	4	Passed Jedec L3		
	(PC1/260°C, +0°C/-5°C)	FAC024 [4]	154	2	Passed Jedec L3		
	(PC2/260°C, +0°C/-5°C)	WNG008 [5]	77	1	Passed Jedec L3		
Precon+Temp Cycle	(PC2/260°C, -40°C/150°C)	FAB024 [3]	230	3	0	0.00	1000 cycles
Precon+HAST	(PC2/260°C, Biased, 110°C/85% RH)	FAB024 [3]	231	3	0	0.00	264 hours
Precon+HAST (Ext.)	(PC2/260°C, Biased, 110°C/85% RH)	FAB024 [3]	226	3	0	0.00	512 hours
Precon+uHAST	(PC2/260°C, Unbiased, 130°C/85% RH)	FAB024 [3]	231	3	0	0.00	96 hours

Notes / Justification:
1) Results from Qual 162018, S25FL256L, 65nm Floating Gate in 16 Lead SOIC (10.3 x 10.3 x 2.65mm)
2) Results from Qual 162001, S25FL256L, 65nm Floating Gate in 8 Contact WSON (6 x 8 x 0.8mm)
3) Results from Qual 162020, S25FL256L, 65nm Floating Gate in 24 Ball FBGA (8 x 6 x 1.2mm)
4) Results from Qual 162019, S25FL256L, 65nm Floating Gate in 24 Ball FBGA (8 x 6 x 1.2mm)
5) Results from Qual 162704, S25FL256L, 65nm Floating Gate in 8 Contact WSON (6 x 8 x 0.8mm)

Preconditioning Flows: PC1 (Exceeds JEDEC L3 and JEITA Rank E): Bake 125°C, 24hr => Soak @ 30°C/70%RH, 216hr => 3x Reflow
PC2 (JEDEC L3): Bake 125°C, 24hr => Soak @ 30°C/60%RH, 192hr => 3x Reflow

Reliability Tests Performed per Specification Requirements

Stress	Condition	Specification Reference
Endurance (100k)	(125°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (100k)	(25°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
Endurance (100k)	(-40°C, 3.6V)	JESD47 / JESD22-A117 / AEC-Q100 /AEC-Q100-005
ESD CDM	N/A	JS002 / AEC-Q100-011
ESD HBM	(100pF, 1500 Ohms)	JS001 / AEC-Q100-002
High Temp Bake	(150°C)	JESD22-A103
High Temp Bake	(200°C)	JESD22-A103
HTOL (EL)	(3.6V, 150°C)	JESD22-A108
HTOL (IL)	(3.6V, 150°C)	JESD22-A108
HTOL (XL)	(3.6V, 150°C)	JESD22-A108
Precon+HAST	(PC2/260°C, Biased, 110°C/85% RH)	JESD22-A110
Precon+HAST (Ext.)	(PC2/260°C, Biased, 110°C/85% RH)	JESD22-A110
Precon+Temp Cycle	(PC2/260°C, -40°C/150°C)	JESD22-A104
Precon+uHAST	(PC2/260°C, Unbiased, 130°C/85% RH)	JESD22-A118
Preconditioning	(PC1/260°C, +0°C/-5°C)	J-STD-020 / EIAJ ED-4701-100 Method 104
Preconditioning	(PC2/260°C, +0°C/-5°C)	J-STD-020

IV. Revision History

Document Number: 002-15110

Document Title: QTP #162018: Qualification of S25FL256L Product, 65nm Floating Gate Serial Interface Flash

Rev.	Issue Date	ECN#	Originator	Description
**	7/7/2016	5342009	FCCL	Initial Release.
*A	10/4/2016	5461221	BAKC	Remove WNH008 package from report
*B	1/4/2018	5959889	BAKC	Updated die size
*C	4/24/2018	6151052	BAKC	Added WNG008 package data from UTL
*D	2/26/2020	6812457	BAKC	Updated Lead Finish for FAB024 and FAC024 package

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