

# S29AL016J

## CS Q06625, Q99467, 81415, Q06571

Qualification of: S29AL016J, 16 Megabit (2 M x 8-Bit/1 M x 16-Bit)  
CMOS 3.0 Volt-only Boot Sector Flash Memory in LAE064, SSO056,  
TSO048 and VBK048 Packages.



### Reliability Qualification Summary

**CONFIDENTIAL**

NOTICE: The material in this report is confidential. It is prepared to assist in the qualification of our product. It is declassified for the internal use of our customers only, and may be modified to meet the needs of specific customers. It also serves as a record of full qualification according to JESD47 and AEC-Q100 Grade 1 requirements.

Additionally, the package details (material set, assembly location, etc.) are specific to the qual vehicle used for the qualification. Alternate material sets and assembly locations may be qualified for the product. Production material can be assembled with any qualified material set and at any qualified assembly location. Tests are performed in accordance with AEC-Q100 and relevant JEDEC specifications.

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## I.A. Product Information

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Product Description: S29AL016J  
16 Megabit (2 M x 8-Bit/1 M x 16-Bit)  
CMOS 3.0 Volt-only Boot Sector Flash Memory

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Package:	LAE064	Qualification:	Q06625
Description:	(9 x 9 x 1.4mm) 64 Ball, Fortified Ball Grid Array Package (fBGA)		
Theta Ja:	39 °C/W	Psi Jt:	11 °C/W
Assembly Location:	Spansion Thailand	Molding Compound:	RoHS Compliant Epoxy Resin
Substrate/Leadframe:	Laminate Substrate	Die Attachment:	Paste
Lead Finish:	96.5Sn3.0Ag0.5Cu Spheres	Bond Wire:	Gold
Comments:			

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Est. Field Temperature:	55 °C	Life Test Temperature:	150 °C
Est. DC Field Current:	20 mA	Life Test Dynamic Current:	7 mA
Est. Field Voltage:	3.0 V	Life Test Voltage:	3.6 V
Est. Field Power Dissipation:	60 mWatts	Est. Stress Power Dissipation:	25.2 mWatts
Est. Field Tj:	57.3 °C	Est. Stress Tj:	150.9 °C

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Die:	98K38A	Die Size:	4.30 x 2.43 mm
Process:	CS69SS (110nm)	Fab:	Spansion Takaku
Type:	Floating Gate	Density:	16M

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## I.B. Product Information

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Product Description: S29AL016J  
16 Megabit (2 M x 8-Bit/1 M x 16-Bit)  
CMOS 3.0 Volt-only Boot Sector Flash Memory.

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Package:	SSO056	Qualification:	Q99467
Description:	(23.7 x 13.3 x 2.0mm) 56 Lead, Shrink Small Outline Package (SSOP)		
Theta Ja:	72 °C/W	Psi Jt:	16 °C/W
Assembly Location:	Spansion Kuala Lumpur	Molding Compound:	RoHS Compliant Epoxy Resin
Substrate/Leadframe:	Laminate Substrate	Die Attachment:	Paste
Lead Finish:	100% Matte Sn Plating	Bond Wire:	Gold
Comments:			

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Est. Field Temperature:	55 °C	Life Test Temperature:	150 °C
Est. DC Field Current:	20 mA	Life Test Dynamic Current:	7 mA
Est. Field Voltage:	3.0 V	Life Test Voltage:	3.6 V
Est. Field Power Dissipation:	60 mWatts	Est. Stress Power Dissipation:	25.2 mWatts
Est. Field Tj:	59.3 °C	Est. Stress Tj:	151.8 °C

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Die:	98K38A	Die Size:	4.30 x 2.43 mm
Process:	CS69SS (110nm)	Fab:	Spansion Takaku
Type:	Floating Gate	Density:	16M



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## I.C. Product Information

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Product Description: S29AL016J  
16 Megabit (2 M x 8-Bit/1 M x 16-Bit)  
CMOS 3.0 Volt-only Boot Sector Flash Memory

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Package:	TS048	Qualification:	81415
Description:	(18.4 x 12.0 x 1.1mm) 48 Lead, Thin Small Outline Package (TSOP)		
Theta Ja:	40 °C/W	Psi Jt:	17 °C/W
Assembly Location:	Spansion Kuala Lumpur	Molding Compound:	RoHS Compliant Epoxy Resin
Substrate/Leadframe:	Laminate Substrate	Die Attachment:	Paste
Lead Finish:	100% Matte Sn Plating	Bond Wire:	Gold
Comments:			

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Est. Field Temperature:	55 °C	Life Test Temperature:	150 °C
Est. DC Field Current:	20 mA	Life Test Dynamic Current:	7 mA
Est. Field Voltage:	3.0 V	Life Test Voltage:	3.6 V
Est. Field Power Dissipation:	60 mWatts	Est. Stress Power Dissipation:	25.2 mWatts
Est. Field Tj:	57.4 °C	Est. Stress Tj:	151.0 °C

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Die:	98K38A	Die Size:	4.30 x 2.43 mm
Process:	CS69SS (110nm)	Fab:	Spansion Takaku
Type:	Floating Gate	Density:	16M



## I.D. Product Information

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Product Description: S29AL016J  
16 Megabit (2 M x 8-Bit/1 M x 16-Bit)  
CMOS 3.0 Volt-only Boot Sector Flash Memory

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Package:	VBK048	Qualification:	Q06571
Description:	(8.15 x 6.15 x 1.0mm) 48 Ball, Very Thin Fine Pitch Ball Grid Array Package (FBGA)		
Theta Ja:	39 °C/W	Psi Jt:	11 °C/W
Assembly Location:	Spansion Thailand	Molding Compound:	RoHS Compliant Epoxy Resin
Substrate/Leadframe:	Laminate Substrate	Die Attachment:	Paste
Lead Finish:	96.5Sn3.0Ag0.5Cu Spheres	Bond Wire:	Gold
Comments:			

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Est. Field Temperature:	55 °C	Life Test Temperature:	150 °C
Est. DC Field Current:	20 mA	Life Test Dynamic Current:	7 mA
Est. Field Voltage:	3.0 V	Life Test Voltage:	3.6 V
Est. Field Power Dissipation:	60 mWatts	Est. Stress Power Dissipation:	25.2 mWatts
Est. Field Tj:	57.3 °C	Est. Stress Tj:	150.9 °C

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Die:	98K38A	Die Size:	4.30 x 2.43 mm
Process:	CS69SS (110nm)	Fab:	Spansion Takaku
Type:	Floating Gate	Density:	16M

## II. CS69SS/LSS 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	1000 hrs	2000 hrs	Ea eV	TAF	VAF	OAF	MTTF (yrs)	Early Life	Inherent Life
PLASTIC											
Sample Size	5600	7272	1200	160							
Zero fails, Process ave. Ea	0 *	0	0	0	0.66	166	1	166		39	2
Totals	0	0	0	0					57078	39	2

\* Contributes to early life FITS

Data Retention Bake - 150 °C

Reliability Stress	Number of Rejects	Sample Size	Failure Rate %	Failure Mechanism
500 hrs	0	2250	0.00	No Failures
1000 hrs	0	2000	0.00	No Failures
2000 hrs	0	2000	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 Q06625, Q99467, 81415, Q06571:							
HTOL (EL)	(3.6V, 150°C)	SSO056 <sup>2</sup>	77	1	0	0.00	168 hours
	(3.6V, 150°C)	TS048 <sup>3</sup>	300	1	0	0.00	168 hours
ESD CDM	N/A	LAE064 <sup>1</sup>	15	1	Passed 1.0kV		
	N/A	SSO056 <sup>2</sup>	15	1	Passed 1.0kV		
	N/A	TS048 <sup>3</sup>	15	1	Passed 1.0kV		
	N/A	VBK048 <sup>4</sup>	15	1	Passed 1.0kV		
ESD HBM	(100pF, 1500 Ohms)	TS048 <sup>3</sup>	15	1	Passed 2.0kV		
	(100pF, 1500 Ohms)	VBK048 <sup>4</sup>	60	1	Passed 2.0kV		
Endurance (10k)	(25°C, 3.6V)	TS048 <sup>3</sup>	256	1	0	0.00	10k cycles
Preconditioning	(PC2/260°C, +0°C/-5°C)	LAE064 <sup>1</sup>	76	1	Passed Jedec L3 / Jeita Rank E		
	(PC2/260°C, +0°C/-5°C)	SSO056 <sup>2</sup>	230	1	Passed Jedec L3 / Jeita Rank E		
	(PC2/260°C, +0°C/-5°C)	TS048 <sup>3</sup>	231	1	Passed Jedec L3 / Jeita Rank E		
Precon+Temp Cycle	(PC1/260°C, -40°C/150°C)	LAE064 <sup>1</sup>	76	1	0	0.00	1000 cycles
	(PC1/260°C, -40°C/150°C)	SSO056 <sup>2</sup>	77	1	0	0.00	1000 cycles
	(PC1/260°C, -40°C/150°C)	TS048 <sup>3</sup>	77	1	0	0.00	1000 cycles
Precon+HAST	(PC1/260°C, Biased, 130°C/85% RH)	SSO056 <sup>2</sup>	76	1	0	0.00	96 hours
	(PC1/260°C, Biased, 130°C/85% RH)	TS048 <sup>3</sup>	77	1	0	0.00	96 hours
Precon+Steam Pressure	(PC1/260°C, 121°C/100%RH/15PSIG)	TS048 <sup>3</sup>	77	1	0	0.00	168 hours
Precon+uHAST	(PC1/260°C, Unbiased, 130°C/85% RH)	SSO056 <sup>2</sup>	77	1	0	0.00	96 hours

#### Generic Reference Data:

Preconditioning	(PC1/260°C, +0°C/-5°C)	VBK048 <sup>5</sup>	461	2	Passed Jedec L3 / Jeita Rank E		
	(PC1/260°C, +0°C/-5°C)	LAE064 <sup>6</sup>	231	1	Passed Jedec L3 / Jeita Rank E		
Precon+Temp Cycle	(PC1/260°C, -40°C/150°C)	VBK048 <sup>5</sup>	154	2	0	0.00	1000 cycles
	(PC1/260°C, -40°C/150°C)	LAE064 <sup>6</sup>	77	1	0	0.00	1000 cycles
Precon+HAST	(PC1/260°C, Biased, 110°C/85% RH)	VBK048 <sup>5</sup>	154	2	0	0.00	264 hours
	(PC1/260°C, 3.6V Bias, 110°C/85% RH)	LAE064 <sup>6</sup>	77	1	0	0.00	264 hours
Precon+Steam Pressure	(PC1/260°C, 121°C/100%RH/15PSIG)	VBK048 <sup>5</sup>	153	2	0	0.00	168 hours
Precon+uHAST	(PC1/260°C, Unbiased, 130°C/85% RH)	LAE064 <sup>6</sup>	77	1	0	0.00	96 hours

- Notes / Justification:
- 1) Results from Qual Q06625, S29AL016J, 16M CS69SS (110nm) Floating Gate in 64 Ball fFBGA (9 x 9 x 1.4mm)
  - 2) Results from Qual Q99467, S29AL016J, 16M CS69SS (110nm) Floating Gate in 56 Lead SSOP (23.7 x 13.3 x 2mm)
  - 3) Results from Qual 81415, S29AL016J, 16M CS69SS (110nm) Floating Gate in 48 Lead TSOP (18.4 x 12 x 1mm)
  - 4) Results from Qual Q06571, S29AL016J, 16M CS69SS (110nm) Floating Gate in 48 Ball vFBGA (8.15 x 6.15 x 1mm)
  - 5) Results from Qual 81220, S29PL032J in 48 Ball vFBGA (8.15 x 6.15 x 1mm) - Same VBK Package and material set, similar technology
  - 6) Results from Qual Q06646, S29GL01GR in 64 Ball fFBGA (9 x 9 x 1.4mm) - Same LAE package and material set

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



## IV. Revision History

Section	Description
Revision A - 12/17/2010	Initial Release.

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