

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 1 of 14

PCIe SAS Connector General Product Specification

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Amphenol

The Product Specification For
PCIe/SAS Connector
PCIe/SAS连接器通用规格书

Product Spec. #
S-SAS-009

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Page
2 of 14

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Table of Contents

1.0	OBJECTIVE	4
2.0	SCOPE	4
3.0	APPLICABLE DOCUMENTS	4
3.1	Application	4
3.2	Military Standards	4
3.3	Federal Specifications	4
3.4	Other Standards and Specifications	4
3.5	EIA Standards	4
4.0	REQUIREMENTS	5
4.1	Qualification	5
4.2	Material	5
4.3	Finish	5
4.4	Design and Construction	6
5.0	ELECTRICAL CHARACTERISTICS	7
5.1	Temperature Rise(Via current cycling) Power section only(P1 thru P15)	7
5.2	Low Level Contact Resistance	7
5.3	Insulation Resistance	7
5.4	Dielectric Withstanding Voltage	7
5.5	Current Rating	8
6.0	MECHANICAL CHARACTERISTICS	8
6.1	Visual and dimensional inspections	8
6.2	Mating / Unmating Force(Insertion/ Removal)	8
6.3	Durability	8
6.4	Contact Retention	9
7.0	ENVIRONMENTAL CHARACTERISTICS	9
7.1	Thermal Shock	9
7.2	Humidity	9
7.3	High Temperature Life	9
7.4	Industrial Mixed Flowing Gas (IMFG)	10
7.5	Physical Shock	10
7.6	Vibration (Random)	10
7.7	Solderability (Lead-Free)	10
7.8	Resistance to soldering heat (Lead-Free)	11
7.9	Moisture Sensitivity Testing	11
8.0	QUALITY ASSURANCE PROVISIONS	12
8.1	Equipment Calibration	12
8.2	Inspection Conditions	12
8.3	Sample Quantity and Description	12
8.4	Acceptance	12
8.5	Qualification Testing	12
8.6	Re-qualification Testing	13
	Qualification Testing Sequences	14

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 4 of 14

1.0 OBJECTIVE 目的

This specification defines the performance, test, quality and reliability requirement of the Amphenol PCIe/SAS host and device connectors.

本规格书定义了PCIe/SAS通用型产品的性能,测试,质量以及可靠性要求。

2.0 SCOPE 范围

This specification is applicable to the termination characteristics of the PCIe/SAS family of products which provides for direct blind mate interconnection of disk drives to backplanes.

本规范适用于 PCIe/SAS 系列产品的特性,该系列产品提供了磁盘驱动器与板的直接盲配对。

3.0 APPLICABLE DOCUMENTS 可适用的文件

3.1 Application 应用

- Engineering drawings 工程图纸

3.2 Military Standards 军用标准

- MIL-STD-202F: Test Methods for Electronic Components Parts 电子元件零件的试验方法
- MIL-STS-1344A : Test Methods for Electrical Connectors 电连接器的试验方法
- MIL-A-45662 : Equipment Calibration 设备校准
- MIL-STD-2166 Connections, Electrical and Compliant Pin 连接, 电气和兼容 Pin

3.3 Federal Specifications 联邦规范

- QQ-N-290 : Nickel Plating (Electrodeposited) 镀镍 (电沉积)
- QQ-S-571 : Solder 焊接

3.4 Other Standards and Specifications 其他标准和规范

- UL94-V0 : Flammability 防火等级
- EIA 364 : Electrical Connector/Socket Test Procedures Including Environmental Classifications 电子连接器/插座测试程序以及环境类别
- SFF-8482 : Internal Serial Attachment Connector 内部串行附件连接器
- SFF-8680 : Serial Attachment 12Gbs 2x Unshielded Connector 串行附件 12Gbs 2x 无屏蔽连接器
- IPC J-STD-001D: Requirements for Soldered Electrical and Electronic Assemblies 焊接电气和电子组件的要求
- T10/2212-D SAS-3: (Serial Attached SCSI) (串行连接的 SCSI)
- SFF-8639 : Multifunction 12 Gb/s 6X Unshielded Connector 多功能12 gb/s 6X 无屏蔽连接器

3.5 EIA Standards EIA 标准

- EIA-364-09, Durability Test 耐久性试验
- EIA-364-13, Mating and Unmating Forces Test 插入力和拔出力试验
- EIA-364-17, Temperature Life with or without Electrical Load Test 具有或无电气负载测试的温度寿命
- EIA-364-18, Visual and Dimensional Inspection for Electrical Connector 电连接器的外观和尺寸检验
- EIA-364-20, Withstanding Voltage Test 耐电压试验
- EIA-364-21, Insulation Resistance Test 绝缘阻抗测试
- EIA-364-23, Low Level Contact Resistance Test 低阶接触阻抗测试
- EIA-364-27, Mechanical Shock (Specified Pulse) Test 机械冲击 (指定脉冲) 试验
- EIA-364-28, Vibration Test 振动试验
- EIA-364-31, Humidity Test 温湿循环测试
- EIA-364-32, Thermal Shock (Temperature Cycling) Test 热冲击 (温度循环) 试验
- EIA-364-38, Cable Pull-Out Test 电缆拉出试验
- EIA-364-41, Cable Flexing Test 电缆弯曲试验
- EIA-364-65, Mixed Flowing Gas 混合气体

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 5 of 14

4.0 REQUIREMENTS 要求

4.1 Qualification 资格

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein. Unless otherwise specified, all measurements shall be performed within the following lab conditions:

根据本规范连接器提供应以满足指定的资格测试需求。除非另有规定,所有测量应当执行以下的实验条件

Temperature 温度: 15 to 35°C

Relative Humidity 相对湿度: 20% to 80%

Atmospheric Pressure 气压: 650mm to 800mm of Hg (86 ~106Kpa)

4.2 Material 材质

Material for each part shall be specified herein, or equivalent. Substitute material shall meet the Performance requirements of this specification.

每一部分的材料应在此处注明,或等同。替代材料应符合此规范的性能要求。

- Receptacle Terminal 母座端子

The base material shall be phosphor-bronze strip or equivalent or better.

基材应为磷青铜或同等或更好。

- Plug Terminal 公座端子

The base material shall be brass or equivalent or better.

基材应为黄铜或同等或更好。

- Plug and Receptacle Insulator Housings 公座和母座绝缘塑胶

The insulators for the plug and receptacle connectors shall be molded of glass filled high performance polyplastic that is rated UL94V-0 or better in accordance with UL-94. See applicable product drawing for material.

公座和母座连接器的绝缘体应按照UL94V-0 或更好的玻璃填充高性能模压成型。请参阅相应的产品图纸。

- Plug and Receptacle special parts 公座和母座专用零件

Refer to the engineer drawing. 请参阅工程图纸。

- Plug board lock or solder tab 公座锁扣或玻铬针

The base material shall be brass or equivalent 基材应为黄铜或当量

- Receptacle board lock or solder tab 母座锁扣或玻铬针

The base material shall be brass or equivalent 基材应为黄铜或当量

4.3 Finish 电镀

- Plated finished for qualification components shall be as specified herein or equivalent.

The plug and receptacle terminals shall be plated in the contact area to the minimum gold plating with gold flash plating thickness specified on product prints(over 1.27um/50u" minimum nickel underplate). The plug and receptacle terminal solder tail's sections shall be plated with 1.27um/50u" Tin minimum as specified on product prints (over 1.27um/50u" nickel minimum underplate). The details please refer to the drawings.

电镀成品的合格部件应按照本协议或同等规定。公座和母座端子的接触区,以最低镀金厚度电镀(1.27um/50 u "最低镍底)。公座和母座端子的焊接区,以1.27um/50 u "锡电镀 (1.27um/50 u"最低镍底)。详情请参阅图纸。

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 6 of 14

- The metal board lock or solder tab for the plug and receptacle connectors shall be plated with 1.27um/50u" Tin minimum as specified on product prints (over 1.27um/50um minimum nickel underplate). No plating at cut-off point.
公座和母座连接器的金属锁扣或玻璃针应按产品电镀时的 1.27um/50 u "锡最小值 (1.27um/50 u"最低镍底) 进行电镀。在截止点不电镀。

4.4 Design and Construction 设计与生产

The plug connector shall be a multi-piece assembly having single row of contacts in the mating area. The contact pattern in the mating area will have short and long terminals in a specific pattern that results in a 0.5mm (0.020") differential between contact points in the long and short terminals. (This allows for first mate-last break capability - see respective product prints for location of short and long terminals.)

公座连接器应为转向离合器组件, 在对插区内有单列的触点。在对插区的接触模式将有短和长的端子, 在一个特定的模式, 导致一个 0.5mm (0.020 ") 之间的接触点之间的长和短端子。

The receptacle connector shall be a multi-piece assembly having single row of contacts in the mating area. The contact pattern in the mating area will have short and long terminals in a specific pattern that results in a 0.5mm (0.020") differential between contact points in the long and short terminals. (This allows for first mate-last break capability – see respective product prints for location of short and long terminals.)The receptacle hold down terminal has the board retention feature that secures the connector to the board in preparation for solder reflow (through-hole).

母座连接器应为转向离合器组件, 在对插区内有单列的触点。在对插区的接触模式将有短和长的端子, 在一个特定的模式, 导致一个 0.5mm (0.020 ") 之间的接触点之间的长和短端子。

A polarization peg (optional) on the bottom of the connector housing assures proper connector orientation during board mounting. The receptacle through hole connector and press fit connector are designed to terminate to board thickness of 1.57mm (0.062"), 2.36mm (0.093") and 3.18mm (0.125"). Visual examination of connectors to be done per EIA 364-18.

在连接器外壳的底部有一个极化 peg (可选), 确保在安装时正确的连接器方向。母座通孔连接器和压合连接器设计适用于 1.57mm (0.062 ")、2.36mm (0.093") 和 3.18mm (0.125 ") 的板厚。连接器外观检查参考 EIA 364-18。

4.4.1 Mating 配插

The connectors shall be capable of mating and unmating manually without the use of special tools. 连接器应能够在不使用特殊工具的情况下手动进行插拔。

4.4.2 Workmanship 工艺

Connectors shall be uniform in quality and shall be free from burrs, scratches, cracks, voids, chips, blisters, pin holes, sharp edges, and other defects that will adversely affect product's life or serviceability

连接器在质量上应一致, 无毛刺、划痕、裂纹、空隙、碎屑、水泡、针孔、锋利的边缘, 以及其它会对产品的寿命或适用性产生不利影响的缺陷。

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 7 of 14

5.0 ELECTRICAL CHARACTERISTIC 电气特性

5.1 Temperature Rise (Via current cycling) Power section only (P1 thru P15)

温升 (通过当前循环) 仅电源部分 (P1 至 P15)

The temperature rise above ambient shall not exceed 30°C at any point in the system when contact positions specified are powered at the power levels specified herein:
当指定的触点位置以此处指定的功率级别供电时, 在系统中的任何位置上的温度升高不得超过30° c:

- a) Ambient Conditions 环境条件: still air at 25°C
- b) Current Rating : 1.5A per pin at power section; 500mA per pin at signal section.
额定电流: 每PIN电源端子1.5A; 每PIN信号端子500mA
- c) Preparation 准备:
 - Wire power pins P1, P2, P8 and P9 in parallel for power.
电源端子 P1、P2、P8 和 P9 并联供电
 - Wire ground pins P4, P5, P6, P10 and P12 in parallel for return.
接地端子P4, P5, P6, P10 和 P12 平行返回。
 - Supply 6 A total of DC current to the power pins in parallel, returning from the parallel ground pins. 将6A的直流电流供电到并联的电源PIN, 从平行的接地引脚返回。
 - Record temperature after 96 hours (45 minutes ON and 15 minutes OFF per hour)
96小时后记录温度
- d) Reference 参考: EIA 364-70A

5.2 Low Level Contact Resistance 低阶接触阻抗

Mate connectors and apply a maximum voltage of 20 mV and a current of 100 mA Per EIA364-23
连接器配插, 并应用最大电压为 20 mV 和电流100毫安; 参考 EIA364-23

The following details shall apply 参照以下条件:

- Test Voltage: 20mV DC maximum at open circuit. 测试电压:20mV 直流最大开路电路。
- Test Current: not to exceed 100mA. 测试电流:不超过100mA
- Requirement : Initially 30mΩ maximum 要求:初始30mΩ 最大

5.3 Insulation Resistance 绝缘阻抗

The insulation resistance of mated connectors shall not be less than 1000 Mega ohm when measured in accordance with EIA 364-21. The following details shall apply:

根据 EIA 364-21 规范, 连接器配插测试的绝缘阻抗不得少于1000兆欧姆。参照以下条件:

- Test Voltage : 500V DC. 测试电压:500V 直流。
- Electrification Time : 1 minute. 电气化时间:1 分钟。
- Point of Measurement : Between adjacent contacts. 测量点:相邻端子之间

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 8 of 14

5.4 Dielectric Withstanding Voltage 绝缘耐压

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current (0.5mA max) when the mated connectors are tested in accordance with EIA 364-20, method B. The following details shall apply:

连接器按照 EIA 364-20 (方法 B) 进行配插测试时, 不应损坏、绝缘击穿或过大泄漏电流 (0.5mA max) 的现象。参照以下条件:

- Test Voltage : 500VAC. 测试电压: 500V 交流
- Test Duration : 1 minute 测试时间: 1 分钟
- Test Condition 测试条件: 1 (760Torr, or sea level)
- Points of measurement: Between adjacent contacts 测量点: 相邻端子之间

5.5 Current Rating 额定电流

1.5A per pin at power section; 电源端子每PIN 1.5A

-Peak current 2.5A 1.5S 峰值电流 2.5A 1.5S

-Peak current pre-Ahange 6A 1ms 峰值电流预 Ahange 6A 1ms

500mA per pin at signal section. 信号端子每PIN 500mA

6.0 MECHANICAL CHARACTERISTIC 机械特性

6.1 Visual and dimensional inspections 外观和尺寸检查

Reference 参考: EIA-364-18

Procedure : Visual, dimensional and functional per applicable quality inspection plan.

程序: 外观、尺寸和功能性都适用质量检验计划

Requirement: Meets product drawing requirements. 要求: 符合产品图纸要求。

6.2 Mating / Unmating Force (Insertion/ Removal) 插入/拔出力 (插入/拔出)

Mate and Un-Mate connectors at a rate of 25 mm per minute per EIA 364-13

连接器插入和拔出的速率为每分钟25毫米/参考EIA 364-13

Mate Force: 插入力

Backplane – 59N Maximum 板端59N 最大

Un-Mate Force: 拔出力

Backplane – 6N minimum 板端6N 最小

Initial and after Durability 初始及耐久测试后

6.3 Durability. 耐久试验

- Number of Cycles 循环次数: Backplane connector 板端连接器: 500 cycles 500次循环
Cabled Connector 线端连接器: 25 cycles 25次循环
- Cycling Rates: Maximum 200 cycles/hour 测试速率: 最大200次循环每小时
- 15 ohm MAX change from initial contact resistance
最大变化值15欧姆
- No damage 无损坏
- Pre-condition 3 cycles 预条件3次循环

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 9 of 14

6.4 Contact Retention 端子保持力

Individual contacts in the plug and receptacle housing shall withstand an axial load of 300 grams (1.27mm pitch) /200grams (0.80mm pitch) minimum applied at a rate of 0.20 inches/minute without dislodging from the housing cavity.

公座和母座塑胶中的单个触点应承受300克 (1.27mm 间距)/200grams (0.80mm 间距) 的轴向负荷, 其最小速度为0.20 英寸/分钟, 而不取出于塑胶。

a) Reference 参考: EIA 364-29B

7.0 ENVIRONMENTAL CHARACTERISTIC 环境特性

After exposure to the following environmental conditions in accordance with the specified test procedures and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 6.0 and 7.0 as specified in Table 1 test sequence. Product subjected to these environmental tests must be applied to printed circuit boards. Unless otherwise specified, the assemblies shall be mated during exposure.

在按照规定的试验程序和/或详细情况接触下列环境条件后, 产品不得出现物理损坏, 并应符合具体规定的每段6.0 和7.0 的电气和机械要求表1中的测试序列。受这些环境测试的产品必须应用于印刷电路板。除非另有规定, 否则环测时应该是配插状态。

7.1 Thermal Shock. 热冲击

Subject mated connectors to 10 cycles between -55°C and $+85^{\circ}\text{C}$. Per EIA 364-32, Test Condition I

连接器配插测试10个循环, 温度在 -55°C 和 $+85^{\circ}\text{C}$ 之间. 参考 EIA 364-32, 测试条件 I

Requirement: Shall meet EIA 364-18 Visual Examination requirements, show no physical damage, and 15 milliohm MAX change from initial contact resistance.

要求: 应符合环境规范EIA364-18 外观检查要求, 显示没有物理损伤, 接触阻抗最大15毫欧变化值

7.2 Humidity 温湿循环

Subject mated connectors to 96 hours at $40 \pm 2^{\circ}\text{C}$ with 90-95% Relative Humidity. Per EIA 364-31, Method II, Test condition A

连接器配插测试96小时, 温度 40 ± 2 , 相对湿度90-95%。参考EIA 364-31, 方法 II, 测试条件 A

Requirement: Shall meet EIA 364-18 Visual Examination requirements, show no physical damage, and 15 milliohm MAX change from initial contact resistance.

要求: 应符合环境规范EIA364-18 外观检查要求, 显示没有物理损伤, 接触阻抗最大15毫欧变化值

7.3 Temperature Life. 温度寿命

Subject mated connectors to $+105^{\circ}\text{C}$ for 500 hours. Per EIA 364-17, Test Condition III, Method A

连接器配插测试 $+105^{\circ}\text{C}$ 500 小时。参考 EIA 364-17, 测试条件 III, 方法 A

Requirement: Shall meet EIA 364-18 Visual Examination requirements, show no physical damage, and 15 milliohm MAX change from initial contact resistance.

要求: 应符合环境规范EIA364-18 外观检查要求, 显示没有物理损伤, 接触阻抗最大15毫欧变化值

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 10 of 14

7.4 Industrial Mixed Flowing Gas (IMFG). 混合气体

- Temperature 温度 : 30°C ± 1°C, 70± 2% RH. Refer to EIA 364-65 Class IIA
- Gas Concentration 气体浓度: Cl₂ 10±3ppb, NO₂ 200±50ppb, H₂S 10±5ppb, SO₂ 100±20ppb
- Half of the samples are exposed unmated for 7 days, then mated for remaining 7 days. Other half of the sample is mated during entire testing.
一半的样品不配插测试7天, 然后再配插测试7天。另外一半的样品在整个测试过程中配插。
- Requirement: Shall meet EIA 364-18 Visual Examination requirements, show no physical damage, and and 15 milliohm MAX change from initial contact resistance.
要求应符合环境规范EIA364-18 外观检查要求, 显示没有物理损伤, 接触阻抗最大15毫欧变化值

7.5 Physical Shock. 物理冲击

- Test condition H per EIA 364-27 参考 EIA 364-27 的测试条件 H
 - Mate connectors and shock at 50 g's with ½ sine wave (11milliseconds) shocks in eachX,Y & Z axis (18 shocks Total)
连接器配插测试,冲击在 50 g 的与½正弦波 (11milliseconds) 冲击在 eachX, Y 和 Z 轴 (18 冲击共计)
 - Mounting : Rigidly mount assemblies 安装:严格安装组件
 - No discontinuities greater than 1 µs and no physical damage observed
不间断大于1µs, 未观察到物理损伤
- Free from any defect such as break, deformation, loosing and falling off etc. on each portion of the connector. Discontinuity <1 microsecond 15 milliohm MAX change from initial contact resistance.
在连接器的每一部分都没有任何缺陷, 如断裂、变形、松动和脱落等。不连续小于1微秒, 接触阻抗最大15毫欧变化值

7.6 Vibration (Random) 振动 (随机)

- Test Condition VII per EIA 364-28 测试条件参考EIA 364-28 VII
 - Duration持续时间 : 15 minutes per axis 每轴15分钟
 - Direction方向: each of 3 orthogonal axis 每3正交轴
 - Power Spectral Density: 3.10G'S RMS 20-500/Hz 功率谱密度: 3.10G'S RMS 20-500/赫兹
 - Mounting: Rigidly mount assemblies. 安装:严格安装组件
 - No discontinuities of 1 µs longer duration. 不间断时间1µs 最大
- Discontinuity <1 microsecond 15 milliohm MAX change from initial contact resistance.
不连续小于1微秒,接触阻抗最大15毫欧变化值

7.7 Solderability (Lead-Free). 可焊性 (无铅)

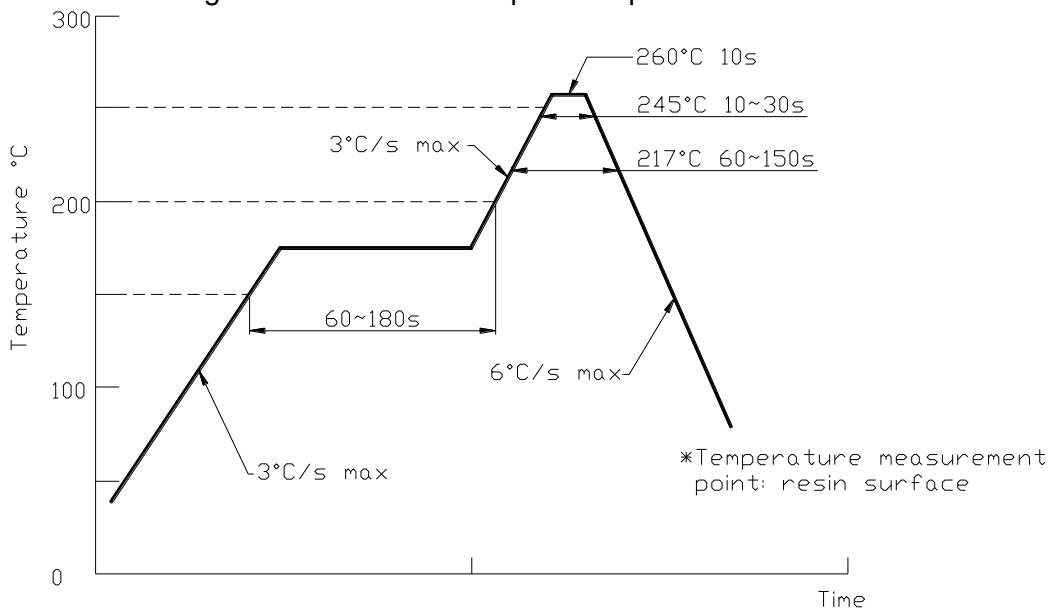
- Pre-heating 预加热: +150°C±10°C, 60~120 sec
- Soldering 焊接: 230°C±5°C , 10±1 sec
- Solder paste to be used in JIS Z 3282 H60A or H63A; soldering particle is more than 200 mesh. Flux used shall be from inactive rosin family.
焊锡膏用于 JIS Z 3282 H60A 或 H63A;焊锡颗粒大于200目。使用的焊剂应来自不活泼的松香系列
- acceptable wet solder coverage: 95% minimum 可接受的湿焊范围: 最低95%
- JIS C 0050or ANSI-J-002 test condition A

7.8 Resistance to soldering heat (Lead-Free). 高温焊接(无铅)

For reflow Solder: 用于回流焊

- Pre-heating 预加热: +150°C ~ 200°C, 60 ~ 180 sec
- Soldering 焊接: 230°C min. 60 sec max.
- Peak Temperature 峰值温度 : 260°C ± 5°C , 10 ± 1 sec
- Number of times 次数: 3 times
- Reference 参考: Peak Reflow – 260 °C
- EIA 364-56

Fig 1 Recommended temperature profile of infrared reflow



7.9 Moisture Sensitivity Testing (For Lead free SMT) 湿度灵敏度测试 (无铅 SMT)

Baking :

- a) Temperature Range 温度范围: +125°C±5°C
- b) Time Duration 时间期限: 24 hours ± 2 hours

Humidification 湿度:

- a) Temperature 温度: +85°C
- b) Relative Humidity 相对湿度: 85%
- c) Test Duration 测试持续时间: 168 hours ± 4 hours

Reflow Soldering 回流焊:

- a) Pre-heating 预加热: 150°C ~ 200°C, 60 ~ 180 sec
- b) Soldering 焊接: 217°C min. 60 ~ 150 sec
- c) Peak Temperature (at solder joint) 峰值温度 (焊接点) : 260°C , 10±1 sec
- d) Number of times 次数: 3 times

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 12 of 14

8.0 QUALITY ASSUANCE PROVISIONS 质量保证条款

8.1 Equipment Calibration. 设备校准

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with MIL-A-45662 and ISO 9000.

所有测试所用的测试设备及检验设施, 均须按照 MIL-A-45662 及 ISO 9000 的规定, 在校准系统内维持。

8.2 Inspection Condition. 检验条件

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions: 除非另有规定, 所有检查应在下列环境条件下进行:

- a) Temperature 温度: 25 ± 5°C
- b) Relative Humidity 相对湿度: 30% ~ 60%
- c) Barometric Pressure 气压: Local ambient 局部环境

8.3 Sample Quantity and Description 样品数量和描述

The numbers of samples to be tested in each group shown in Qualification Testing Sequences are defined as follows: Groups A through J:

5 samples in each group: All samples must be free of defects that would impair normal connector operation. All samples must meet dimensional requirements of connector.

在资格测试序列中显示的每个组中要测试的样本数定义如下: A 到 J 组

每组5样品: 所有样品必须无缺陷, 会损害正常的连接器操作。所有样品必须满足连接器的尺寸要求

8.4 Acceptance 验收

8.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 and 7.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

在测试样品上放置的电气和机械要求, 如段所示6.0 和7.0 应使用适当的统计技术从测试数据中建立, 否则应由客户指定, 所有按照本产品规格测试的样品均应符合规定的要求。

8.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective actions shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

由于设备、测试设置或操作员错误而导致的故障不应取消产品的资格。如果发生产品故障, 纠正措施不应取消产品的资格。如果发生产品故障, 应采取纠正措施, 并重新提交样品以进行鉴定。

8.5 Qualification Testing. 资格测试

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequence shall be as shown in Qualification Testing Sequences

对生产中通常使用的设备和程序所生产的样品单位, 应进行资格测试。测试顺序应如资格测试序列所示

Visual Examination外观检查: EIA 364-18

Amphenol	The Product Specification For PCIe/SAS Connector PCIe/SAS连接器通用规格书	Product Spec. # S-SAS-009		Date : 05/06/19
		Rev : E	ECN# HK8193	Page 13 of 14

8.6 Requalification Testing. 重新资格测试

If any of the following conditions occur, the responsible product engineer shall initiate prequalification testing consisting of all applicable parts of the qualification test matrix Table 1. 如果出现下列任何情况, 负责的产品工程师应开始进行资格预审测试, 包括合格测试矩阵表1的所有适用部分。

- a) A significant design change is made to the existing product which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, insulator design, contact base material, or contact lubrication requirements.
对影响产品形态、适合性或功能的现有产品进行重大设计变更。重大变化的例子应包括但不限于, 在电镀材料的组成或厚度, 接触力, 接触面几何, 绝缘体设计, 接触基材, 或接触润滑要求的变化
- b) A significant change is made to the manufacturing process, which impacts the product form, fit or function.
对制造过程产生重大变化, 影响产品的形式、适合或功能
- c) A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.
在生产或最终使用过程中发生重大事件, 需要针对产品设计或制造工艺采取纠正措施

Amphenol

The Product Specification For
PCIe/SAS Connector
PCIe/SAS连接器通用规格书

Product Spec. #
S-SAS-009

Date :
05/06/19

Rev :
E

ECN#
HK8193

Page
14 of 14

Qualification Testing Sequences

群组测试序列

		1	2	3	4	5	6	7	8	9
Examination of product(s) 产品检验		1,5	1,9	1,8	1,8	1,6	1,3	1,3	1,5	1
Temperature Rise 温升	5.1			7						
LLCR 低阶接触阻抗	5.2	2,4	3,8	2,4,6		2,5			2,4	
Insulation Resistance 绝缘阻抗	5.3				2,6					
Dielectric withstanding voltage 绝缘耐压	5.4				3,7					
Mating force/ Unmating force 插入力/拔出力	6.2		2,5							
Durability(include pre-cond.) 耐久测试	6.3	3	4							
Contact Retention 端子保持力	6.4									2
Thermal shock 热冲击	7.1				4					
Humidity Temperature cycling 温湿循环	7.2				5					
High Temperature Life 高温寿命	7.3			3					3	
IMFG 混合气体	7.4					3				
Physical shock 物理冲击	7.5		7							
Vibration 振动	7.6		6							
Solderability(lead-free) 可焊性(无铅)	7.7						2			
Resistance to soldering heat 耐焊接热	7.8							2		
Reseating(manually unmating/mating three times) 重新拔插(手动对插3次)				5		4				

Notes:

- 1 5PCS sample in each group
- 2 Durability (Pre-Condition): refer to 6.3.