



# MINI FAKRA 系列连接器产品规格书

## MINI FAKRA Series CONNECTOR SPECIFICATION

版次 Revision	日期 Date	修订履历 Modify	作成者 Producer
X0	20230522	初版发行	LEO
作成部门 Department	作成 Producer	确认 Confirmation	承认 Recognition
工程 部	LEO	Jay Yan	Jieguo Xie

## 【1】参考文献

References:

产品外观、尺寸、电气性能、机械性能、环境性能等规格参考  
ISO20860&USCAR-2/17/18//21/49&EIA-364 标准。

Product appearance, size, electrical performance, mechanical performance, environmental performance and other specifications refer to ISO20860&USCAR-2/17/18/21/49&EIA-364 standards.

## 【2】产品适用范围

Scope of product application

本规范使用于 MINI FAKRA 系列连接器，包含了产品的性能、试验方法和要求。

This specification applies to MINI FAKRA connector series, contains the product performance, test methods and in specification requirements.

## 【3】产品结构、外观和尺寸

Product Structure, dimension and Appearance:

结构、尺寸、主要部件的材料和表面处理应在图纸中规定。

不得有任何划痕，裂缝，污渍或翘曲对连接器的功能或外观有伤害。

Structure, dimension, material and surface plating were defined in drawings.

There shall be no scratches, cracks, stains or warp that are detrimental to the function or the appearance of the connector.

## 【4】额定值

Ratings

项目 Item	规格 Standard	
最大容许电压 Maximum allowable voltage	60V DC MAX	[AC(有效值 rms)/DC]
最大容许电流 Maximum allowable current	1A MAX	
工作温度范围 Temperature range	-40°C ~ +105°C	

## 【5】 部件仓储条件 Storage condition (reference item)

项目 Item	规格内容 Standard
储存温度 Storage temperature	20±8°C
储存湿度 Storage humidity	20%-65%RH Less than 20%-65%RH
储存期限 Storage life	1 年(焊接最佳时段为 6 个月以内) one year (The best time for welding is within 6 months)

1) 产品储存区域应保持清洁干燥，以免产品被污染或受潮变质。

To avoid product contamination or moisture deterioration ,Product storage area should be kept clean and dry.

2) 产品的摆放应整齐，排列井然有序，叠放时要做到“上小下大、上轻下重”。

Products should be placed neatly in an orderly. The bigger and heavier the product is , the lower you put .

3) 产品不可直接堆放在地板上，用卡板堆放。

Products should not directly stacked on the floor, please put them by card-board.

## 【6】 试验条件 Test Conditions

试验及测量如果没有特别的规定，就按周围温度 5 ~ 35°C，相对湿度为 20-85%RH，普通气压 86 ~ 106kPa 来实施。但是，如果按此标准测量出的值有疑义时，以判定状态为准。

The test and measurement shall be conducted at the ambient temperature of 5 ~ 35°C.relative Humidity of 20-85%RH or less,and normal atmospheric pressure of 86 ~ 106kPa unless otherwise Specified.If the judgment made on the basis of the values measured standard conditions is doubtful the test and measurement should be made under the judgment conditions.

## 【7】 试验判定状态

Judgment conditions

判定状态是指:有规定环境条件下，周围温度 5 ~ 35°C，相对湿度为 20-85%RH，普通气压 86 ~ 106kPa 的环境状态下。

Judgment conditions,environmental conditions under which the measurement is conducted.Are the conditions of ambient temperature of 5 ~ 35°C relative humidity of 20-85%RH normal atmospheric pressure of 86-106kPa.

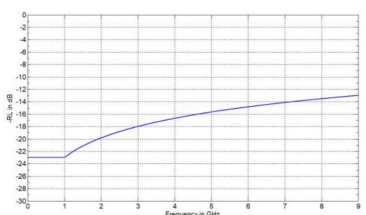
【8】.试验要求及程序

Test Requirement and Procedure

8.1 外观、尺寸检查 Appearance、Dimension Examination

NO.	试验项目 Items	试验条件 Test Condition	规格 Requirement
8.1.1	外观检查 Visual Examination	应按照每张图纸目视确认。 应使用适当的测量仪器确认。 Refer to the product drawing visually. Use test equipment. <b>USCAR-2</b>	外观良好, 不存在有害问题。 (变质, 裂缝, 畸形等) Good surface, no scratch, bending, broken allowed
8.1.2	尺寸检查 Dimension Examination	符合图纸要求和 <b>USCAR-18</b> Meets requirements of product drawing and <b>USCAR-18</b>	适当的测量仪器确认 Use test equipment

8.2.电气的性能 Electrical performance

NO.	试验项目 Items	试验条件 Test Condition	规格 Requirement												
8.2.1	特性阻抗 Characteristic Impedance	使用网络分析仪进行测试, 调入网络分析仪中的损耗测试程序, 先接入校准模块进行校准, 再进行测试。 Use Network Analyzer to test, set the analyzer to return loss test mode. Before test, do the adjustment first. <b>USCAR-17</b>	50Ω												
8.2.2	回波损耗 Return Loss	通过网络分析仪测试。 频率范围为 DC 0~9GHz Tested by network analyzer. Frequency: DC 0~9GHz <b>USCAR-49 4.2.4</b>  <div style="text-align: center;"> <p><small>Table 7 - Return loss requirement</small></p> <table border="1" style="margin: auto;"> <thead> <tr> <th>Frequency, GHz</th> <th>Return Loss Requirement, Max.</th> </tr> </thead> <tbody> <tr> <td>0.01 &lt; f ≤ 1</td> <td>≤ -23 dB</td> </tr> <tr> <td>1 &lt; f ≤ 9</td> <td>≤ 10 <math>\frac{\log f(\text{GHz})}{\log 9} - 23</math></td> </tr> </tbody> </table>  </div>	Frequency, GHz	Return Loss Requirement, Max.	0.01 < f ≤ 1	≤ -23 dB	1 < f ≤ 9	≤ 10 $\frac{\log f(\text{GHz})}{\log 9} - 23$	<table border="1" style="margin: auto;"> <thead> <tr> <th>Frequency, GHz</th> <th>Return Loss Requirement, Max.</th> </tr> </thead> <tbody> <tr> <td>0.01 &lt; f ≤ 1</td> <td>≤ -23 dB</td> </tr> <tr> <td>1 &lt; f ≤ 9</td> <td>≤ 10 <math>\frac{\log f(\text{GHz})}{\log 9} - 23</math></td> </tr> </tbody> </table>	Frequency, GHz	Return Loss Requirement, Max.	0.01 < f ≤ 1	≤ -23 dB	1 < f ≤ 9	≤ 10 $\frac{\log f(\text{GHz})}{\log 9} - 23$
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8.2.3	插入损耗 Insertion Loss	<p>通过网络分析仪测试。 频率范围为 DC 0~6GHz Tested by network analyzer. Frequency: DC 0~6GHz <b>USCAR-17</b></p>	<p>0-3GHz ≤0.30dB 3-6GHz ≤0.45dB</p>
8.2.4	近端串音 Near-End Crosstalk	<p>通过网络分析仪测试。 频率范围为 DC 0~9GHz Tested by network analyzer. Frequency: DC 0~9GHz <b>USCAR-49 4.4</b></p>	<p>0.01-4GHz ≤-60dB 4-9GHz ≤-50dB (Pin 1-2、Pin 1-3、Pin 1-4)</p>
8.2.5	屏蔽衰减 Shielding attenuation	<p>通过网络分析仪测试。 频率范围为 0.1-9GHz Tested by network analyzer. The frequency range is 0.1-9 GHz <b>USCAR-49 4.5.3</b></p>	<p>0.1-2GHz ≤-62dB 2-5GHz ≤-55dB 5-9GHz ≤-50dB</p>
8.2.6	转移阻抗 Transfer impedance	<p>通过网络分析仪测试。 频率范围为 0.01-100MHz Tested by network analyzer. The frequency range is 0.01-100MHz <b>USCAR-49 4.6.3</b></p>	<p>0.01-50MHz ≤-27dB 50-100MHz ≤-30dB</p>
8.2.7	接触电阻 Contact Resistance	<p>采用低电平压降方式测量电阻值。 开路电压:20mV MAX 电流:100mA MAX Testing by the voltage dropping method with the low level current. Open circuit voltage:20mV MAX Circuit current:100mA MAX <b>USCAR-49 D.2</b></p>	<p>中心导体初始接触电阻≤24mΩ,25次 Min 插拔或环境试验后接触电阻≤24mΩ The initial contact resistance of the center conductor is ≤24mΩ, and the contact resistance is ≤24mΩ after 25 Min insertion and removal or environmental test 外导体初始接触电阻≤10mΩ,25次 Min 插拔或环境试验后接触电阻≤10mΩ The initial contact resistance of the outer conductor is ≤10mΩ, and the contact resistance is ≤10mΩ after 25 Min insertion and removal or environmental test</p>

8.2.8	绝缘电阻 Insulation Resistance	在内外导体之间施加 500V DC 的电压，测试时间至少 15 秒钟。 Testing by applying the specified voltage (DC 500 V) between the inner and ground contacts for at least 15 seconds. <b>USCAR-49</b>	$\geq 100M\Omega$
8.2.9	耐电压 Dielectric Withstanding Voltage	相邻端子间或端子与地面间施加 AC 500V (有效值) 历时 1 分钟测量。 AC 500V (rms) shall be applied for 1 minute to between next terminal. <b>USCAR-49 4.7.2</b>	无击穿现象 No breakdown

## 8.3.机械的性能

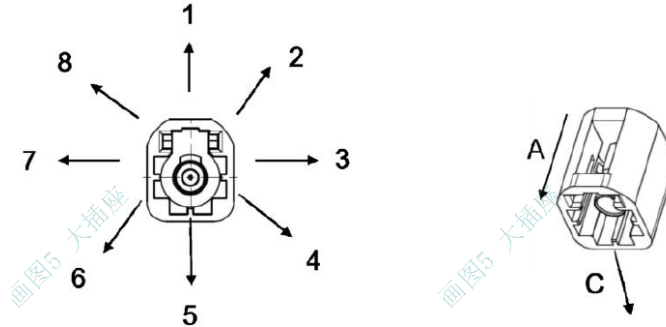
## Mechanical Performance

NO.	试验项目 Items	试验条件 Test Condition	规格 Requirement
8.3.1	连接器插入力 Connector insertion Force	将插座和插头在室温中以 50±10mm / min 的速度进行插入动作，测量插入峰值负载（不带锁扣）。 Insert the socket and plug at room temperature at a rate of 50±10mm / min to measure Connector insertion Force(without lock). <b>USCAR-17</b>	$\leq 25N$ (单孔) $\leq 25N$ (Single hole) $\leq 45N$ (双孔) $\leq 45N$ (Double hole) $\leq 60N$ (4 孔) $\leq 60N$ (Four hole)
8.3.2	连接器拔出力 Connector pulling Force	将插座和插头在室温中以 50±10mm / min 的速度进行拔出动作，测量拔出峰值负载（不带锁扣）。 Insert the socket and plug at room temperature at a rate of 50±10mm / min to measure Connector pulling Force(without lock). <b>USCAR-17</b>	$\geq 5N$
8.3.3	外壳保持力 Housing Retention Force	以 50mm/min 的速率，沿轴向对主体和外壳进行分离量测外壳从主体拔出时的力。 With the speed 50mm/min, measuring the retention force when pull the housing out from the main body. <b>USCAR-17</b>	$\geq 110N$

8.3.4	中心针保持力 Center contact retention force	固定连接器沿需测试方向以 50±10mm / min 的速度沿轴向对端子和绝缘体进行分离量测中心针从绝缘体拔出时的力。 Separate the terminal and insulator axially with a fixed connector at a speed of 50±10mm/min in the direction to be tested. Measure the force when the central pin is pulled out of the insulator. <b>USCAR-17</b>	≥10N
8.3.5	锁扣强度 Lock intensity	在连接器装配状态 (锁定状态) 下, 在 35°C 的环境温度中以 50±10mm / min 的速度拉动插座, 测量锁扣机构脱离或破坏时的负载。 The socket is pulled the speed for 50±10mm / min and load in case the Locke mechanism breaks away or breaks is measured in 35°C atmosphere. <b>USCAR-49 D.1</b>	≥110N (初态) (Initial state) ≥80N (环境后) (Post-environmental)
8.3.6	扣位错差力 Coding efficiency	将正确的对配件错开 90° 插入连接器内测试插入力。 correct the parts to be staggered 90 degrees into the connector to test insertion force. 将其他型号 Coding 插入连接器内测试插入力。 Insert other coding models into the connector to test the insertion force. <b>USCAR-17</b>	≥150N
8.3.7	重复插拔测试 Repeated insertion withdrawal test	手动将插座和插头以 20mm / min 的速度插拔 25 次 (不带锁扣)。 Manually insert socket and plug 25 times at 20 mm/min speed (without lock). <b>ISO20860-1</b>	外观无损坏 Appearance No damage ≤25N (单孔) ≤25N (Single hole) ≤45N (双孔) ≤45N (Double hole) ≤60N (4 孔) ≤60N (Four hole) 接触电阻 Contact Resistance
8.3.8	侧向负荷测试 Header side load	测试样品在 1C, 3C, 5C, 7C, 8C 方向施加 75N 的力, 方向矢量 C 绕连接器轴旋转 360°。直角电缆连接器的附加测试: 应在护套的最末端 (离中心线最远的地方) 施加侧载。施加 75N, 持续 5 秒。监测中心导体的连续性。 A force of 75N is applied to the test sample in the directions 1C, 3C, 5C, 7C, 8C, and the direction vector C is rotated 360° around the connector	没有电流中断 1μsec 或更长时间 No current interruption of 1μ sec or longer. 外观无损坏 Appearance No damage

axis. Additional tests for right-angle cable connectors: Side loads should be applied at the very end of the sheath (farthest from the center line). Apply 75N for 5 seconds. Monitor the continuity of the central conductor.

**USCAR-49 4.8.2**



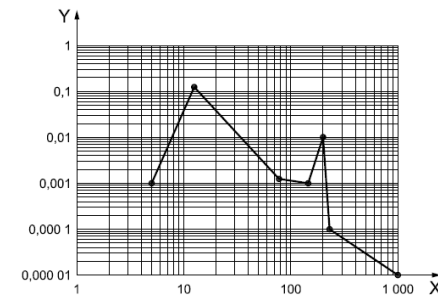
连接器安装在振动台上, 冲击: 三个相互垂直的方向上, 每个方向进行 10 次冲击, 35g 力, 持续时间 10 毫秒; 振动: 三个相互垂直的方向上每个方向 8 个小时的 1.81Grms 振动。连接器安装在振动台上。

Shock : ten shock is each of the three mutually perpendicular axes, half sine acceleration 35g, duration 10ms ; Vibration classification see table and Duration 8h in each of the mutually perpendicular axes, at a speed of 1 octave per minute.

**USCAR-17、USCAR-2**

Frequency Hz	Power spectral density g <sup>2</sup> /Hz
5,0	0,002 00
12,5	0,248 00
77,5	0,003 20
145,0	0,002 00
200,0	0,011 80
230,0	0,000 32
1 000,0	0,000 02

g<sub>rms</sub> = 1,81.



X frequency, Hz  
Y power spectral density, g<sup>2</sup>/Hz

没有电流中断 1μsec 或更长时间  
No current interruption of 1μ sec or longer.

外观无损坏  
Appearance No damage

接触电阻  
Contact Resistance

绝缘阻抗  
Insulation Resistance

耐电压  
Withstand voltage

特性阻抗  
Characteristic Impedance

插入损耗  
Insertion Loss

回波损耗  
Return Loss

8.3.9

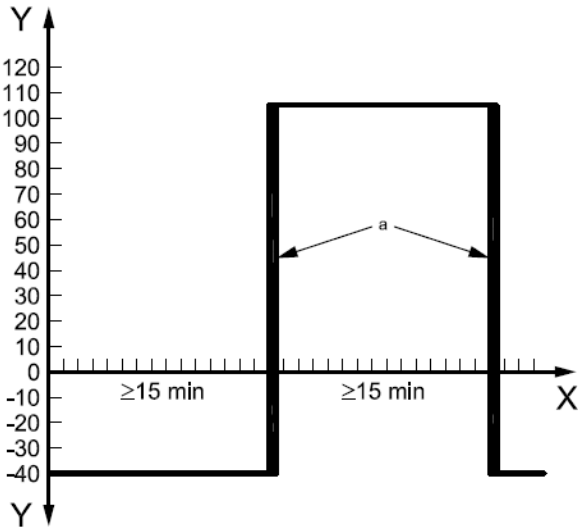
振动冲击试验  
Vibration/Shock test



8.3.10	跌落测试 Drop Test	<p>准备连接器组件,其中包含在预期应用中使用的所有组件 (CPA, 杠杆/滑块等),将样品分 6 组, 用于测试 X、Y 和 Z 轴方向,每个面从高度 1 米垂直落到混凝土或钢板上, 记录组件的任何损坏或移动/分离, 验证每个样品连接器组件。</p> <p>Prepare the test samples including(CPA/Lever/Sliding block,etc).Divide the samples into 6 groups for testing at X,Y and Z direction.Drop from 1M high and fall on the floor or on a steel plate.Take note of every sample' s situation after the drop test.</p> <p><b>USCAR-2</b></p>	<p>没有影响功能或外观无裂缝缺陷等的证据。 连接器锁定机构必须正常运行而不会破损。</p> <p>No impact on function and surface.The connector is well mated and work well without any broken.</p>
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8.4.环境性能

Environment Performance

NO.	试验项目 Items	试验条件 Test Condition	规格 Requirement
8.4.1	冷热冲击试验 Thermal shock test	<p>连接器对插 10 次后, -40°C 低温 30 分钟, 105°C 高温 30 分钟切换不超过 30s, 100 次循环测试。</p> <p>After the connector is inserted for 10 times, - 40 ° low temperature for 30 minutes, 105 ° high temperature for 30 minutes, the switching shall not exceed 30s, 100 cycles.</p> <p><b>USCAR-17</b></p> <p>X time Y temperature, °C a Maximum transition time is 30 s.</p> 	<p>外观无损坏 Appearance No damage</p> <p>接触电阻 Contact Resistance</p> <p>绝缘阻抗 Insulation Resistance</p> <p>耐电压 Withstand voltage</p> <p>特性阻抗 Characteristic Impedance</p> <p>插入损耗 Insertion Loss</p> <p>回波损耗 Return Loss</p>

<p>8.4.2</p>	<p>温湿度循环 Temperature Humidity Cycling</p>	<p>连接器对插 10 次后，测试周期：40 个循环</p> <table border="1"> <thead> <tr> <th>时间</th> <th>温度</th> <th>相对湿度</th> </tr> </thead> <tbody> <tr> <td>0.5H</td> <td>-40±3℃</td> <td>不控制</td> </tr> <tr> <td>4.5H</td> <td>+80~+90℃</td> <td>80-90%</td> </tr> <tr> <td>2.0H</td> <td>+105℃±3℃</td> <td>不控制</td> </tr> <tr> <td>1.0H</td> <td>23±3℃</td> <td>不控制</td> </tr> </tbody> </table> <p>After the connector is inserted for 10 times, Test Cycle:40</p> <table border="1"> <thead> <tr> <th>Time</th> <th>temperature</th> <th>Relative humidity</th> </tr> </thead> <tbody> <tr> <td>0.5hrs</td> <td>-40±3℃</td> <td>uncontrolled</td> </tr> <tr> <td>4.5hrs</td> <td>+85±3℃</td> <td>80-90%</td> </tr> <tr> <td>2.0hrs</td> <td>+105±3℃</td> <td>uncontrolled</td> </tr> <tr> <td>1.0hrs</td> <td>+23±3℃</td> <td>uncontrolled</td> </tr> </tbody> </table> <p><b>USCAR-17/USCAR-2</b></p>	时间	温度	相对湿度	0.5H	-40±3℃	不控制	4.5H	+80~+90℃	80-90%	2.0H	+105℃±3℃	不控制	1.0H	23±3℃	不控制	Time	temperature	Relative humidity	0.5hrs	-40±3℃	uncontrolled	4.5hrs	+85±3℃	80-90%	2.0hrs	+105±3℃	uncontrolled	1.0hrs	+23±3℃	uncontrolled	<p>外观上无异常 Appearance No damage</p> <p>接触电阻 Contact Resistance</p> <p>绝缘阻抗 Insulation Resistance</p> <p>耐电压 Withstand voltage</p> <p>特性阻抗 Characteristic Impedance</p> <p>插入损耗 Insertion Loss</p> <p>回波损耗 Return Loss</p>
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<p>8.4.3</p>	<p>高温放置试验 Heat resistance</p>	<p>将连接器放置在 105±3℃的温度下放置 1008 小时，然后静置直到恢复常温后测量。</p> <p>The connector under the temperature of 105 ± 3 °C for 1008 hours, then let stand until after normal temperature measurement.</p> <p><b>USCAR-17/USCAR-2</b></p>	<p>外观无损坏 Appearance No damage</p> <p>接触电阻 Contact Resistance</p> <p>绝缘阻抗 Insulation Resistance</p> <p>耐电压 Withstand voltage</p> <p>特性阻抗 Characteristic Impedance</p> <p>插入损耗 Insertion Loss</p> <p>回波损耗 Return Loss</p>																														

8.4.4	盐水喷雾试验 Salt Spray Test	将连接器放置 $35\pm 2^{\circ}\text{C}$ 、 $5\pm 1\%$ 的盐水喷雾(48H); 试验后常温水洗; 再室温干燥, 常温常湿放置 1-2 小时。 The connector is (48H)exposure to a salt spray from $5\pm 1\%$ solution at $35\pm 2^{\circ}\text{C}$ . Use water at room temperature to wash ;To dry at room temperature Keep wet for 1-2 hours. <b>EIA-364-26</b>	外观无损坏 Appearance No damage  接触电阻 Contact Resistance
8.4.5	可焊性 Solderability	将连接器端子焊接部分浸入助焊剂后, 在 $245\pm 5^{\circ}\text{C}$ 的无铅锡槽中历时 $3\pm 0.5$ 秒。 The terminal of connector shall be put into the flux and dipped into Pb free solder bath $245\pm 5^{\circ}\text{C}$ 、 $3\pm 0.5\text{s}$ <b>EIA-364-52</b>	沾锡面积 95%以上 Soldering area more than 95%
8.4.6	耐焊性 Resistance to soldering test	在以下条件下进行焊料耐热性测试。 在 DIP 工艺的情况下。 温度: $260\pm 5^{\circ}\text{C}$ ; $10\pm 1$ 秒。 The pin header shall be tested resistance to soldering heat in the following condition. In case of DIP. Temperature : $260\pm 5^{\circ}\text{C}$ ; $10\pm 1\text{s}$ . <b>EIA-364-56</b>	外观无损坏 Appearance No damage



【9】产品测试组别 Test Sequence:

NO.	测试组别 Test Sequence	A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	Q	R	S
	样品数量 Quantity	10	5	5	10	12	5	10	18	10	10	10	5	5	5	3	2	3	3
	检查项目 Test Name																		
1	外观检查 Surface examination	1,3	1	1	1,3	1,3	1,6	1,16	1,3	1,16	1,17	1,16	1,5	1,3	1,3	1	1	1	1,5
2	尺寸检查 Dimension Examination															2	2	2	2
3	连接器循环 Connector cycle							2		2	2	2				3	3	3	3
4	电路连续性 Circuit Continuous							8		8	8	8							
5	特性阻抗 Characteristic Impedance							3,9		3,9	3,9	3,9				4			
6	回波损耗 Return Loss							4,10		4,10	4,10	4,10				5			
7	插入损耗 Insertion Return Loss							5,11		5,11	5,11	5,11				6			
8	近端串音 Near-End Crosstalk															7			
9	屏蔽衰减 Shielding attenuation							6,12		6,12	6,12	6,12					4		
10	转移阻抗 Shielding Transfer Impedance(STI)																	4	
11	接触电阻 Contact Resistance						2,5	7,13		7,13	7,13	7,13	2,4						
12	绝缘阻抗 Isolation Resistance							14		14	14	14							
13	耐电压 Voltage Withstanding							15		15	15	15							
14	插入/拔出力 Mating/unmating Force	2					3												
15	外壳保持力 Housing Retention Force		2																
16	中心针保持力 Central Pin Retention Force			2															
17	锁扣强度 Lock intensity				2						16	16							



18	扣位防错差力 Coding efficiency					2													
19	侧向负荷测试 Header side load																		4
20	重复插拔测试 Repeated insertion withdrawal test					4													
21	振动/机械冲击 Shock/Vibration						8												
22	跌落试验 Drop Test							2											
23	冷热冲击 Thermal Shock								8										
24	温湿度循环 Temperature and Humidity Cycle									8									
25	高温测试 High-Temp. Exposure										8								
26	盐水喷雾试验 Salt Spray Test											3							
27	可焊性 Solderability												2						
28	耐焊性 Resistance to soldering heat													2					