

**OAKR Test Report** Page 1 of 19 Test report:

Test Request By:	Bel Fuse Limited		
Tested Product Name:	0AKR Fuse	Date of Received:	2019/06/07
Type Designation:	0AKR 150A 0AKR 300A 0AKR 400A	Serial No:	Engineering Sample
Test Specification:	Qualification Test, refer to JS	AE JASO D622	
Test Place:			
Test Result:	The tested sample mentione specification	d above <b>Pass</b> the te	esting according to test
Test By:		Review By:	
Date:	2019/06/07	Date:	2019/06/29
Others:			
Qualification Test for 0AKR	Series		



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### **TEST PLAN**

No.	Group	Test item	Testing according to	Type name	Quantity	Test condition	Acceptable Value/Range
1	0	DCR	UL248-1	0AKR 150A 0AKR 300A 0AKR 400A	12pcs	Surrounding environment: 23+/ -5°C, measuring current <=10% rated current, test point: fuse cap	Test data
2	A	Temperature rise	I SO8820-8 JASO D622	Same as above	2pcs from Item 1	Surrounding environment: 23+/ -5°C, measuring current 0.5ln	<50K
3	В	Temperature /humidity cycling	JASO D622 6.3.4.1	Same as above	2pcs from Item 1	10 temperature/humidity cycles per standard in a constant temperature and humidity chamber	No appearance damage,Rc < 10%
4	В	Hot / cold shock test	JASO D622 6.3.6	Same as above	2pcs from Item 1	48 cycles, -30° C-100° C;	No appearance damage, Rc < 10%
5	В	High temperature storage	Bel Spec.	Same as above	2pcs from Item 1	125°C for 100 hours	No appearance damage, Rc < 10%
6	В	Mechanical shock	JASO D622 6.3.3	Same as above	2pcs from Item 1	Ambient temperature: 23+ - 5°C, fixed fuse in vibration tester, 10-55hz, sinusoidal, peak value 1.5mm; One way 2 hours, three ways	No appearance damage, Rc < 10%
7	В	Impulse current cycle test	Refer to JASO D622 6.3.2	Same as above	2pcs from Item 1	Ambient temperature: 23+ - 5 °C , impulse current 2ln/0.25s and 0.5ln/ 15s for one cycle, total 50,000 cycles.	No appearance damage, Rc < 10%
8	В	Wipe with Gasoline oil	Refer to GB/T31465.1-5.4	Same as above	All the above tested samples	Wipe the tubes with gasoline / lube for 30s each,	Marking will be indelible and easily legible
9	В	Terminal strength test	JASO D622 ISO8820-8	Same as above	All the above tested samples	Disassemble the fuse with 12+/-1Nm (M8)	Terminal remains physically intact after three times disassemble



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5. TEST IMAGE......ERROR! BOOKMARK NOT DEFINED.

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### 1. Purpose

Verify the electrical and reliability of the product.

### 2. Test equipment

Equipment	Туре	Manufacturer
Multimeter	34401A	Agilent
Programmable DC Power supply	PST-3201	GW
Programmable DC Power Supply	PSM-3004	GW
mOHM meter	1154D	DHK
Current Shunt	2M-05	T&M Research
Oscilloscope	TDS5104B	Tektronix
DC electronic Load	63209	Chroma
Electric vibration system	RT-S50ZY	SZZL
Power Supply	6V3000A	YST
Temperature Measurement	40032	TH
Temperature/Humidity Chamber	RHP-150CT	REALE
Thermal Shock Chamber	TSA-71H-W	REALE

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### 3. Test equipment and scheme

The test was conducted according to the test scheme of 0AKR\_Test\_Report\_2019. Mark the sample number (sample number from 1-12) and use the same sample to test all items in the test plan.

### 4. Test result

#### 4.1.1 Initial test result

4.1.2 DCR (No. 1)

**Test result** pass

#### Table 1 0AKR 150A (No. 1)

#### **Error! Reference**

Type:	source not found.		source not found.				
Start date:	2019/06/08			Finish date:	20	019/06/08	
Room	25.7℃			Room	66%		
temperature:	25.7 C	C		humidity.	0070		
No.\ Item	DCR	Visual		No.\ Item	DCR	Visual	
Unit:	mΩ			Unit:	mΩ		
Maximum:				Maximum:			
		No				No	
		appearance				appearance	
Minimum:		damage		Minimum:		damage	
1	0.612	pass		7	0.611	pass	
2	0.604	pass		8	0.620	pass	
3	0.608	pass		9	0.607	pass	
4	0.613	pass		10	0.618	pass	
5	0.605	pass		11	0.603	pass	
6	0.608	pass		12	0.617	pass	

#### Table 2 0AKR 300A (No. 1)

#### **Error! Reference**

Type:	<b>source not found.</b> 2019/06/08								
Start date:			date: 2019/06/08		F	inish date:	201	9/06/08	_
Room	25.7℃	0F 7°C		05.7°C		Room	66%		
temperature:	25.7 C		h	umidity.	0076				
No.\ Item	DCR	Visual	N	lo.\ Item	DCR	Visual			
Unit:	mΩ		L	Jnit:	mΩ				



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Maximum:			Maximum:			
		No			No	
		appearance			appearance	
Minimum:		damage	Minimum:		damage	
1	0.2976	pass	7	0.2964	pass	
2	0.2983	pass	8	0.2961	pass	
3	0.2975	pass	9	0.2955	pass	
4	0.2923	pass	10	0.2927	pass	
5	0.2951	pass	11	0.2933	pass	
6	0.2939	pass	12	0.2908	pass	

#### Table 3 0AKR 400A (No. 1)

Errori Reference

	Error! R	Reference					
Type: source not found.							
Start date:	2019/06/08		•	Finish date:	201	9/06/08	
Room	0F 7°C		•	Room	66%		-
temperature:	25.7℃			humidity.	00%		
No.\ Item	DCR	Visual		No.\ Item	DCR	Visual	
Unit:	mΩ			Unit:	mΩ		
Maximum:				Maximum:			
		No				No	
		appearance				appearance	
Minimum:		damage		Minimum:		damage	
1	0.1868	pass		7	0.1874	pass	
2	0.1855	pass		8	0.1886	pass	
3	0.1920	pass		9	0.1903	pass	
4	0.1917	pass		10	0.1911	pass	
5	0.1895	pass		11	0.1913	pass	
6	0.1863	pass		12	0.1897	pass	

### 4.2. Electrical test result group A

4.2.1 Temperature rise (No. 2)

Test result:	pass
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Table 4 0AKR 150A (No. 2)

Туре	0AKR 150A		
		Finisl	n
Start date:	2019/06/09	date	2019/06/09



Test report: **OAKR Test Report** Page 7 of 19 Room Room 41% temperature 24.5°C Humidity. Temperatur e rise No.\ Item @0.5In Visual Unit: Κ Maximum: 50 No appearance Minimum: damage 22.3 pass 2 21.8 pass Table 5 0AKR 300A (No. 2) Type 0AKR 300A Finish 2019/06/10 Start date: 2019/06/10 date: Room 41% 24.9℃ Room temperature Humidity. Temperatur e rise No.\ Item @0.5In Visual Unit: Κ Maximum: 50 No appearance Minimum: damage 27.9 pass 2 28.3 pass Table 6 0AKR 400A (No. 2) 0AKR 400A Type Finish Start date: 2019/06/10 date: 2019/06/10 Room 41% temperature 24.9℃ Room Humidity. Temperatur e rise No.\ Item @0.5In Visual

Unit:



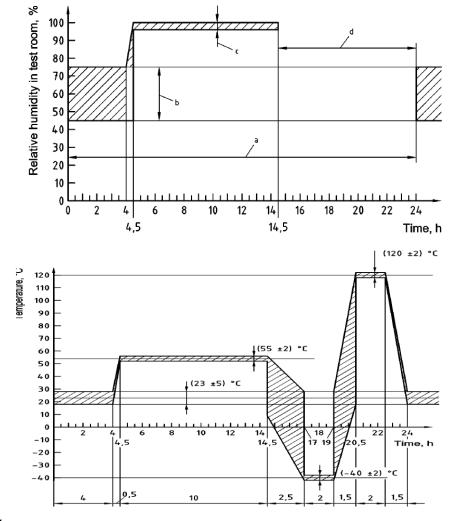
Maximum: 50			UAKR Iest Re	port	Page 8 of 19			
	Maximum:	50						
			No					
			appearance					

		No			
		appearance			
Minimum:		damage			
1	32.6	pass			
2	31.4	pass			

### 4.3. Reliability test result group B

### 4.3.1 Temperature /humidity cycling test result(No. 3)

10 temperature-humidity cycles according the following setting and 24 hours per cycle



**Test result:** pass

Table 7 Error! Reference source not found. (No. 3)

Type:	0AKR 150A		
Start date:	2019/06/08	Finish	2019/06/19



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		date:		
24.7℃		Room	55%	
24.7 C		Humidity.	0070	
DCR	Visual			
mΩ				
	No			
	appearance			
	damage			
0.616	pass			
0.624	pass			
	mΩ 0.616	DCR Visual mΩ  No appearance damage  0.616  pass	Room Humidity.  DCR Visual	24.7°C         Room Humidity.           DCR         Visual           mΩ            No appearance damage            0.616         pass

#### Table 8 Error! Reference source not found. (No. 3)

Type:	0AKF	R 300A				
			Finish			
Start date:	2019	/06/08	date:	2019/	06/19	
Room temperature:	24.7°C		Room Humidity.	55%		
No.\ Item	DCR	Visual				
Unit:	mΩ					
Maximum:						
		No appearance				
Minimum:		damage				
3	0.2996	pass				
4	0.2948	pass				

#### Table 9 Error! Reference source not found. (No. 3)

Type:	0AKF	R 400A					
			•	Finish			
Start date:	2019	/06/08		date:	2019/	06/19	
Room	24.7°C			Room	55%		
temperature:	24.7 C			Humidity.	33 /0		
No.∖ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
		No					
		appearance					
Minimum:		damage					
3	0.1936	pass					
4	0.1933	pass					



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#### 4.3.2 Hot / cold shock test result (No. 4))

48 cycles of hot / cold shock and the condition of single cycle as the following:

- 1. -30+/-2°C continued 30min;
- 2. Switching time 15s maximum;
- 3. 100+/-2°C continued 30min;
- 4. Switching time 15s maximum;

Test result: pass

#### Table 10 Error! Reference source not found.(No. 4)

**Error! Reference** Type: source not found. Finish 2019/06/11 2019/06/14 Start date: date: Room Room 24.9°C 57% temperature. humidity. No.\ Item **DCR** Visual Unit:  $m\Omega$ Maximum: No appearance Minimum: damage 5 0.615 pass 6 0.62 pass

#### Table 11 Error! Reference source not found.(No. 4)

**Error! Reference** Type: source not found. Finish 2019/06/14 Start date: 2019/06/11 date: Room Room 24.9°C 57% temperature. humidity. **DCR** Visual No.\ Item Unit:  $m\Omega$ Maximum: No appearance Minimum: damage 5 0.2984 pass 6 0.2959 pass

Table 12 Error! Reference source not found.(No. 4)



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Type: source not found.

Finish

Start date: 2019/06/11 date: 2019/06/14

Room Room 24.9°C 57% humidity temperature

temperature.			numidity.		
No.∖ Item	DCR	Visual			
Unit:	mΩ				
Maximum:					
		No			
		appearance			
Minimum:		damage			
5	0.1908	pass			
6	0.188	pass			

### 4.3.3 High temperature storage test result (No. 5)

Test result: **Pass** 

#### Table 13 Error! Reference source not found. (No. 5)

0AKR 150A Type: Finish

2019/06/18 2019/06/12 Start date: date:

Room Room 24.1°C 60% humidity temperature

temperature.			numiaity.		
No.\ Item	DCR	Visual			
Unit:	mΩ				
Maximum:					
		No			
		appearance			
Minimum:		damage			
7	0.618	pass			
8	0.631	pass			

#### Table 14 Error! Reference source not found. (No. 5)

Type:	0AKR 300A		
		Finish	
Start date:	2019/06/12	date:	2019/06/18
Room	24.1℃	Room	60%
temperature.	24.1 C	humidity.	00%



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	No.\ Item	DCR	Visual						
	Unit:	mΩ							
	Maximum:								
			No						
			appearance						
	Minimum:		damage						
	7	0.2984	pass						
	8	0.2935	pass						

#### Table 15 Error! Reference source not found. (No. 5)

Type:	0AKR 400A						
			•	Finish			
Start date:	2019	/06/12	_	date:	2019/	06/18	_
Room	24.1℃			Room	60%		_
temperature.	24.1 C			humidity.	00 70		
No.\ Item	DCR	Visual					
Unit:	mΩ						
Maximum:							
		No					
		appearance					
Minimum:		damage					
7	0.1895	pass					
8	0.1906	pass					

### 4.3.4 Mechanical shock test result (No. 6)

Test result:	Daga
Lest result:	Pass

Table 16 Error! Reference source not found. (No. 6)

**Error! Reference** source not found. Type: Finish Start date: 2019/06/21 2019/06/26 date:: Room Room 24.5°C 58% temperature. humidity. No.\ Item DCR visual Unit:  $\, m\Omega$ Maximum: No appearance Minimum: damage



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9	0.615	pass						
10	0.628	pass						

#### Table 17 Error! Reference source not found. (No. 6)

**Error! Reference** 

Type: source not found.

Finish

Start date: 2019/06/21 date:: 2019/06/26

Room Room 58% 24.5°C temperature. humidity.

			mannanty.			
DCR	visual					
mΩ						
	No					
	appearance					
	damage					
0.2983	pass					
0.297	pass					
	mΩ 0.2983	mΩ  No appearance damage  0.2983  pass	DCR visual mΩ  No appearance damage  0.2983 pass	MΩ  No appearance damage  0.2983 pass	DCR visual mΩ  No appearance damage  0.2983 pass	DCR visual mΩ  No appearance damage  0.2983 pass

#### Table 18 Error! Reference source not found. (No. 6)

**Error! Reference** source not found.

Finish Start date: 2019/06/21 date:: 2019/06/26 Room Room 58% 24.5°C

temperature.	24.5 C		humidity.	30%	
No.\ Item	DCR	visual			
Unit:	mΩ				
Maximum:					
		No			
		appearance			
Minimum:		damage			
9	0.1924	pass			
10	0.1935	pass			

4.3.5 Impulse current cycle test result(No. 7)

Test result: **Pass** 

Table 19 Error! Reference source not found. (No. 7)

Type:



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Type: source not found.

Finish

Start date:: 2019/06/10 date: 2019/06/22

Room Room 25.7°C 61% humidity temperature

temperature.			numuity.		
No.\ Item	DCR	Visual			
Unit:	mΩ				
Maximum:					
		No			
		appearance			
Minimum:		damage			
11	0.612	pass			
12	0.625	pass			

#### Table 20 Error! Reference source not found. (No. 7)

**Error! Reference** 

source not found. Type:

Finish

date: Start date:: 2019/06/10 2019/06/22

Room Room 25.7℃ 61% temperature. humidity.

			mannanty.			
DCR	Visual					
mΩ						
	No					
	appearance					
	damage					
0.2944	pass					
0.2953	pass					
	mΩ 0.2944	mΩ No appearance damage 0.2944 pass	mΩ  No appearance damage  0.2944  pass	DCR Visual mΩ  No appearance damage  0.2944 pass	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	DCR         Visual           mΩ            No         appearance           damage            0.2944         pass

#### Table21 Error! Reference source not found. (No. 7)

**Error! Reference** 

Type: source not found.

Finish

date: 2019/06/22 Start date:: 2019/06/10

Room Room 61%

25.7℃ temperature. humidity.

No.\ Item	DCR	Visual			
Unit:	mΩ				
Maximum:					
Minimum:		No			



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		appearance							
		damage							
11	0.1938	pass							

### 4.3.6 Test result of wiping the tubes with gasoline / lube, (No. 8)

pass

\*Gasoline is GB #92, lubricating oil is synthetic oil.

0.1915

**Test result: Pass** 

#### Table 22 Error! Reference source not found. (No. 8)

Type:	0AKR 1	150A					
			-	Finish			
Start date::	2019/0	6/28	_	date:	2019/0	06/28	<u></u>
Room	25.1℃			Room	63%		_
temperature.	25.1 C			humidity.	0370		
	Marking			Marking			
	can be			can be			
No.∖ Item	recognized		No.∖ Item	recognized			
Unit:			Unit:				
Maximum:			Maximum::				
Minimum::			Minimum::				
1	pass		7	pass			
2	pass		8	pass			
3	pass		9	pass			
4	pass		10	pass			
5	pass		11	pass			
6	pass		12	pass			

#### Table 22 Error! Reference source not found. (No. 8)

Type:	0AKR (	300A	_				
			_	Finish			
Start date::	2019/06/28		_	date:	2019/	06/28	
Room	0F 1°C		_	Room	63%		
temperature.	25.1℃			humidity.	0370		
	Marking			Marking			
	can be			can be			
No.∖ Item	recognized		No.∖ Item	recognized			
Unit:			Unit:				
Maximum:			Maximum::				



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Minimum::		Minimum::			
1	pass	7	pass		
2	pass	8	pass		
3	pass	9	pass		
4	pass	10	pass		
5	pass	11	pass		
6	pass	12	pass		

#### Table 24 Error! Reference source not found. (No. 8)

Type:	0AKR 4	400A					
			-	Finish			
Start date::	2019/0	6/28	_	date:	2019/	06/28	_
Room	25.1℃			Room	63%		
temperature.	25.1 C			humidity.	0370		
	Marking			Marking			
	can be			can be			
No.∖ Item	recognized		No.∖ Item	recognized			
Unit:			Unit:				
Maximum:			Maximum::				
Minimum::			Minimum::				
1	pass		7	pass			
2	pass		8	pass			
3	pass		9	pass			
4	pass		10	pass			
5	pass		11	pass	·		
6	pass		12	pass			

### 4.3.7 Terminal strength test, (No. 9)

**Test result: Pass** 

#### Table 25 Error! Reference source not found. (No. 9)

Type:	0AKR <sup>2</sup>	150A					
			•	Finish			
Start date:	2019/0		date:	2019/0			
Room			•				•
temperatu	25.1℃			Room 63%			
re.				humidity.			
No.\ Item	Times of	Visual		No.\ Item	Times of	Visual	

<sup>\*</sup>Gasoline is GB #92, lubricating oil is synthetic oil.



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	disassembling			disassemblin		
	_			g		
Unit:			Unit:			
			Maximum			
Maximum:			:			
		No			No	
		appearance			appearance	
Minimum:	3	damage	Minimum:	3	damage	
1	>3	pass	7	>3	pass	
2	>3	pass	8	>3	pass	
3	>3	pass	9	>3	pass	
4	>3	pass	10	>3	pass	
5	>3	pass	11	>3	pass	
6	>3	pass	12	>3	pass	

#### Table 26 Error! Reference source not found. (No. 9)

Type:	0AKR 3	300A				
			_	Finish		
Start date:	2019/0	6/08		date:	2019/0	06/26
Room			_			
temperatu	25.1℃			Room	63%	
re.				humidity.		
			1	ı		

				Times of		
	Times of			disassemblin		
No.\ Item	disassembling	Visual	No.\ Item	g	Visual	
Unit:			Unit:			
			Maximum			
Maximum:			:			
		No			No	
		appearance			appearance	
Minimum:	3	damage	Minimum:	3	damage	
1	>3	pass	7	>3	pass	
2	>3	pass	8	>3	pass	
3	>3	pass	9	>3	pass	
4	>3	pass	10	>3	pass	
5	>3	pass	11	>3	pass	
6	>3	pass	12	>3	pass	

#### Table 27 Error! Reference source not found. (No. 9)

Type:	0AKR 400A	_	
		Finish	
Start date:	2019/06/08	date:	2019/06/26



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Room

63% temperatu 25.1℃ Room

humidity. re.

			mannanty.			
				Times of		
	Times of			disassemblin		
No.\ Item	disassembling	Visual	No.\ Item	g	Visual	
Unit:			Unit:			
			Maximum			
Maximum:			:			
		No			No	
		appearance			appearance	
Minimum:	3	damage	Minimum:	3	damage	
1	>3	pass	7	>3	pass	
2	>3	pass	8	>3	pass	
3	>3	pass	9	>3	pass	
4	>3	pass	10	>3	pass	
5	>3	pass	11	>3	pass	
6	>3	pass	12	>3	pass	

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## 5. Test image

#### Image 1, Mechanical shock curve

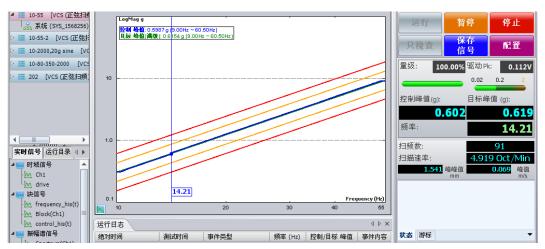


Image 2, Hot -cold shock curve

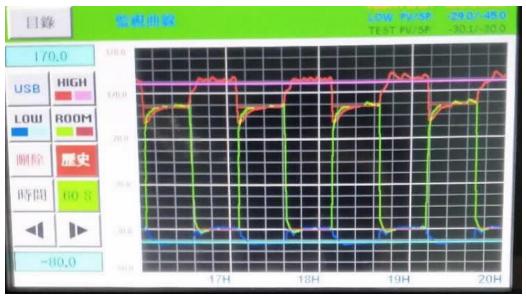


Image 3, Temperature-humidity cycling curve

