

IV. Test Results

1. Solderability

The test results for Sn-Ag-Cu and Pb-Sn solders are shown in Tables 1 and 2.

Both Pb-free products and Pb products fulfill the soldering time less than 3s.

Table 1 Solderability for Sn-3Ag-0.5Cu solder

Test No.	1		2		3		4		
Mold size (mm)	φ2.5×3.0L		φ3.0×5.0L		φ3.0×5.0L		φ4.0×7.5L		
Lead dia. (mm)	φ0.56		φ0.6		φ0.8		φ0.8		
Device type	ERA22- ^{**}		ERA81- ^{**}		ERB83- ^{**}		ERB32- ^{**}		
Finishing solder	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	
Zero-cross time (s)	1	1.25	0.56	1.25	0.49	1.63	0.64	1.57	0.75
	2	1.18	0.54	1.54	0.74	1.65	0.74	1.57	0.66
	3	1.29	0.58	1.31	0.60	1.75	0.75	1.38	0.65
	4	1.20	0.54	1.22	0.52	1.58	0.77	1.73	0.76
	5	1.18	0.50	1.23	0.58	1.62	0.66	1.55	0.78
Maximum value (s)	1.29	0.58	1.54	0.74	1.75	0.77	1.73	0.78	
Average value (s)	1.22	0.54	1.31	0.59	1.65	0.71	1.56	0.72	
Test No.	5		6		7				
Mold size (mm)	φ4.0×7.5L		φ6.4×7.5L		φ7.5×10L				
Lead dia. (mm)	φ1.0		φ1.2		φ1.8				
Device type	ERC25- ^{**}		ERD07- ^{**}		ERD09- ^{**}				
Finishing solder	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn			
Zero-cross time (s)	1	1.65	0.74	2.00	1.00	1.95	0.90		
	2	2.02	0.89	2.07	0.91	2.47	1.19		
	3	2.04	0.98	2.09	0.90	1.88	0.88		
	4	2.34	0.96	1.75	0.86	2.20	0.92		
	5	1.81	0.85	1.73	0.71	2.22	0.95		
Maximum value (s)	2.34	0.98	2.09	1.00	2.47	1.19			
Average value (s)	1.98	0.88	1.93	0.88	2.14	0.97			

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Table 2 Solderability for Sn-37Pb solder

Test No.	1		2		3		4		
Mold size (mm)	φ2.5×3.0L		φ3.0×5.0L		φ3.0×5.0L		φ4.0×7.5L		
Lead dia. (mm)	φ0.56		φ0.6		φ0.8		φ0.8		
Device type	ERA22- ^{**}		ERA81- ^{**}		ERB83- ^{**}		ERB32- ^{**}		
Finishing solder	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	
Zero-cross time (s)	1	1.77	0.76	1.77	0.81	1.82	0.84	1.73	0.81
	2	1.82	0.83	1.86	0.78	2.19	0.92	2.27	0.91
	3	1.75	0.72	1.96	0.82	2.39	0.98	2.07	1.02
	4	1.92	0.83	1.93	0.87	1.90	0.87	2.02	0.85
	5	1.90	0.84	1.80	0.88	1.62	0.73	1.92	0.86
Maximum value (s)	1.92	0.84	1.96	0.88	2.39	0.98	2.27	1.02	
Average value (s)	1.83	0.80	1.86	0.83	1.98	0.87	2.00	0.89	
Test No.	5		6		7				
Mold size (mm)	φ4.0×7.5L		φ6.4×7.5L		φ7.5×10L				
Lead dia. (mm)	φ1.0		φ1.2		φ1.8				
Device type	ERC25- ^{**}		ERD07- ^{**}		ERD09- ^{**}				
Finishing solder	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn			
Zero-cross time (s)	1	2.05	0.90	2.52	1.05	1.93	1.08		
	2	1.68	0.79	2.49	0.79	2.56	0.91		
	3	2.56	1.08	2.31	0.74	2.55	0.92		
	4	1.93	1.04	1.72	1.16	2.14	0.99		
	5	2.53	0.86	1.68	1.04	2.19	1.07		
Maximum value (s)	2.58	1.08	2.31	1.16	2.56	1.08			
Average value (s)	2.15	0.93	2.14	0.96	2.59	0.99			

2. Resistance of dip soldering

The test results are shown in Table 3.

Both Pb-free products and Pb products fulfill the criteria.

Table 3 Resistance of dip soldering

Test No.	1		2		3		4	
Mold size (mm)	φ2.5×3.0L		φ3.0×5.0L		φ3.0×5.0L		φ4.0×7.5L	
Lead dia. (mm)	φ0.56		φ0.6		φ0.8		φ0.8	
Device type	ERA22- ^{**}		ERA81- ^{**}		ERB83- ^{**}		ERB32- ^{**}	
Finishing solder	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn
Electrical	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5
External appearance	0/5	0/5	0/5	0/5	0/5	0/5	0/5	0/5
Test No.	5		6		7			
Mold size (mm)	φ4.0×7.5L		φ6.4×7.5L		φ7.5×10L			
Lead dia. (mm)	φ1.0		φ1.2		φ1.8			
Device type	ERC25- ^{**}		ERD07- ^{**}		ERD09- ^{**}			
Finishing solder	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn	Sn-Cu	Pb-Sn		
Electrical	0/5	0/5	0/5	0/5	0/5	0/5		
External appearance	0/5	0/5	0/5	0/5	0/5	0/5		

Note: 0/5 stands for the number of failure/tested samples.

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3. Resistance of iron soldering

The test results by soldering iron are shown in Table 4.

Both Pb-free products and Pb products fulfill the criteria.

Table 4 Resistance of iron soldering

Test No.	5	
Mold size (mm)	φ4.0×7.5L	
Lead dia. (mm)	φ1.0	
Device type	ERC04-**	
Finishing solder	Sn-Cu	Pb-Sn
Electrical	0/25	0/25
External appearance	0/25	0/25

Note: 0/25 stands for the number of failure/tested samples.

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