AP-10

Part No. Plug: 3531-**01-00T, 3539-**01-45*

Receptacle: 3532-**01-00T, 21022-001E

Product Specification

Qualification Test Report No. TR-19063

Rev.	ECN	Date	Prepared by	Checked by	Approved by
10	S25323	August 6,2025	K.Mizobuti	S. Kamada	Y. Hashimoto
9	S25166	April 16, 2025	F.Jin	S. Kamada	Y. Hashimoto
8	S24255	June 25, 2024	W. Lau	Y. Shimizu	M. Takemoto
7	S24119	April 2, 2024	W. Lau	Y. Shimizu	M. Takemoto

1. Scope

This product specification defines the test conditions and the performances of the Power terminal, board-to-board.

2. Product Name and Parts No.

2.1 Product Name

AP-10

2.2 Parts No.

Plug: 3531-**01-00T,3539-**01-45*
Receptacle: 3532-**01-00T, 21022-001E

3. Rating

3.1 Operating Conditions

Amperage: DC 30A
Component Temperature (Energization) : 233 to 378K(-40℃ to 105℃)
(BY CURRENT TEMPERATURE RISING OF TERMINAL IS ⊿15.0℃ MAX.)
Operating humidity: 85% MAX. (Non-condensing)

3.2 Storage Conditions

Storage temperature: 248 to 333K(-25℃ to 60℃)
Storage humidity: 85% MAX. (Non-condensing)

*Keeping the production in the above conditions, we asked to use them within 1 year after delivery.

4. Test and Performance

Test Condition

Unless otherwise specified, all tests and measurements shall be performed.
under the following conditions in accordance with MIL-STD-202.

Temperature: 288K to 308K（15℃ to 35℃）
Pressure: 866hPa to 1066hPa（650mmHg to 800mmHg）
Relative humidity: 45 to 75%R.H.

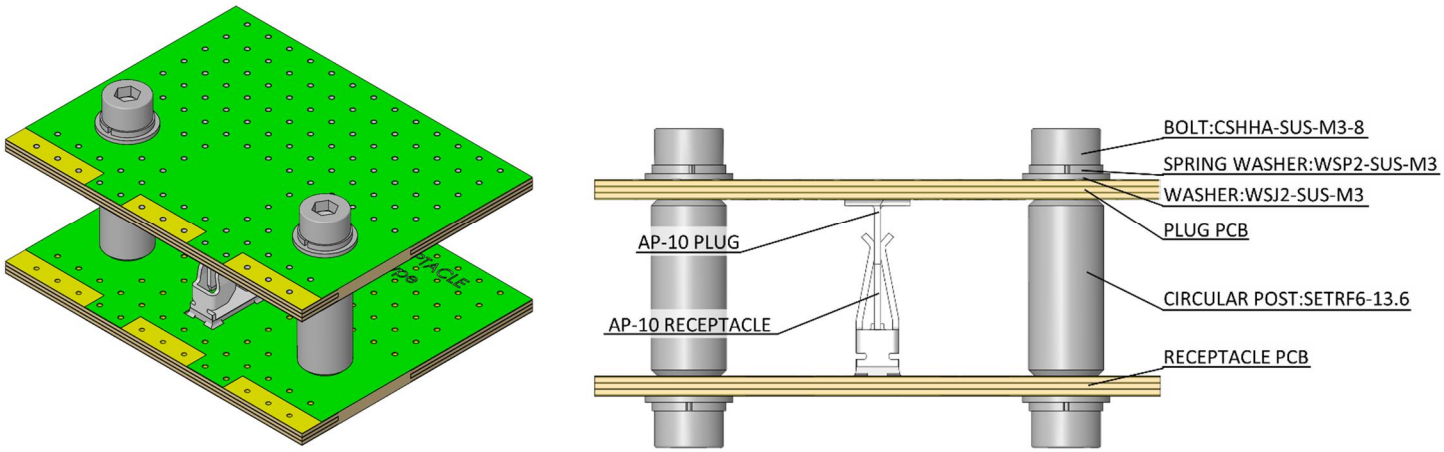
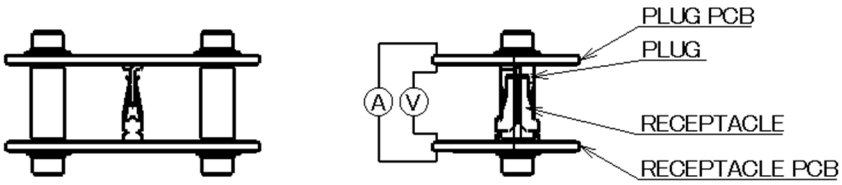


Fig.1 Mating test sample (Assembly with stainless JIG)

4.1. Electrical Performance

1. Contact resistance	
Reference standard:	MIL-STD-202, Method 307
Test conditions:	Solder the receptacle terminal to the test board and mate the plug terminal together, then measure the contact resistance by the four terminal methods. Apply the low level condition of 20mV MAX. DC for the open circuit voltage and 10mA MAX. DC for the closed circuit current in accordance with MIL-STD-202 G, Method 307.
	
	Fig.2 Contact Resistance
Pass criteria:	Initial: 1.0 mΩ max. After testing: 1.0 mΩ max.

2. Temperature rising	
Reference standard:	-
Test conditions:	Mate the plug and receptacle terminal together and then apply rating current per contact.
Pass criteria:	Over ambient ⊿T15.0 ℃ max.

4.2. Mechanical Performance

1. Mating force / Unmating force	
Reference standard:	-
Test conditions:	Solder the receptacle terminal to the test board, then place the board and plug on push-on/pull-off machine, measure of initial and mating/un-mating at a speed 25±3mm/minutes along the mating axis.
Pass criteria:	Initial: 15 N max. 3cycles: 15 N max.

2. Durability	
Reference standard:	-
Test conditions:	Solder the receptacle terminal to the test board, then place the board and plug on the push-on/pull-off machine, and repeat mating and un-mating at a speed 25±3 mm/minutes. along the mating axis.
Pass criteria:	Contact Resistance: Shall meet 4.1.1.

3. Vibration	
Reference standard:	IEC 60068-2-6
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and place them on the vibrator. During the testing, run 100mA DC to check electrical discontinuity. Frequency: 10-500 Hz Acceleration: 98m/s2(10G) Directions, Duration :3 mutually perpendicular and direction 24 hours about each direction.
Pass criteria:	Contact Resistance: Shall meet 4.1.1. Electrical discontinuity: No electrical discontinuity greater than 1μs shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

4. Shock	
Reference standard:	IEC 60068-2-27
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and place them on the shock machine. MAX.G: 490 m/s2(50G) Duration: 11 msec. Wave Form: Half Sinusoidal Directions, cycle: 6mutually perpendicular direction, 3 cycles about each direction
Pass criteria:	Contact Resistance: Shall meet 4.1.1. Electrical discontinuity: No electrical discontinuity greater than 1μs shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

5. Electrode fastness test	
Reference standard:	IEC60068-2-21
Test conditions:	Push the receptacle soldered to the test board from the four directions. Load ： 10 N Retention time ： 10 sec. Directions ： Four directions horizontal to the test board, one time each direction
Pass criteria:	No abnormality adversely affecting the performance shall not occur.

4.3. Environmental Performance

1. High temperature life	
Reference standard:	IEC 60068-2-2
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and expose them to the following environment in accordance. Temperature: 378±2K (105±2℃) Duration: 1000 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

2. High Temperature Life (Energization)	
Reference standard:	IEC 60068-2-2
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and expose them to the following environment in accordance. During the testing, run rated Amperage. Temperature: 378±2K (105±2℃) Duration: 1000 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

3.Low Temperature Life	
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and expose them to the following environment in accordance. Temperature: 233±2K (-40±2℃) Duration: 1000 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

4. Low Temperature Life (Energization)	
Reference standard:	IEC 60068-2-1
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and expose them to the following environment in accordance. During the testing, run rated Amperage. Temperature: 233±2K (-40±2℃) Duration: 1000 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

5.High Temperature and humidity	
Reference standard:	IEC 60068-2-66, 60068-2-67, 60068-2-78
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and expose them to the following environment in accordance. Temperature: 333±2K (60±2℃) Humidity: 90 to 95%RH Duration: 1000 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

6.High Temperature and humidity (Energization)	
Reference standard:	IEC 60068-2-66, 60068-2-67, 60068-2-78
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal and expose them to the following environment in accordance. During the testing, run rated Amperage. Temperature: 333±2K (60±2℃) Humidity: 90 to 95%RH Duration: 1000 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

7. Temperature cycling	
Reference standard:	-
Test conditions:	Solder the receptacle terminal to the test board, then mate the plug terminal. After installing the mating sample and expose them to the following environmental conditions. Temperature: 233K(-40℃), 30minutes→378K (105℃) 30minutes (See Fig.3) Duration: 1000 cycles
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

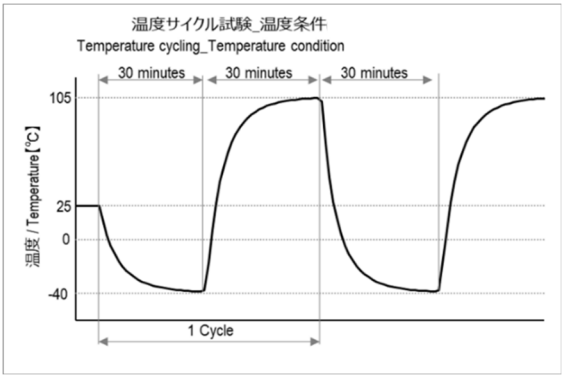


Fig.3 Temperature cycling _Temperature condition

4.3. Environmental Performance

8. Temperature and humidity cycling	
Reference standard:	IEC 60068-2-38
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and expose them to the following environment in accordance. During the a to g, run rated Amperage in every 15 minutes. Duration: 10 cycles (24 hours×10=240 hours), See Fig.8
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

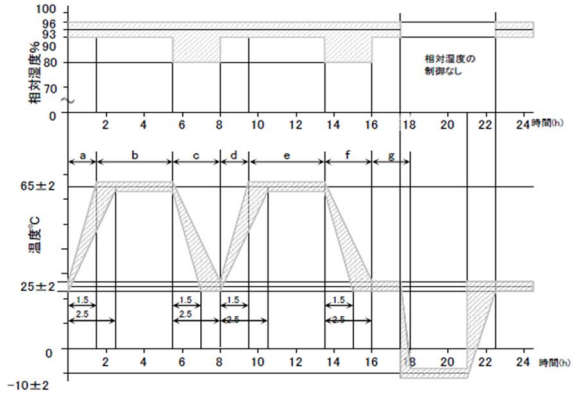


Fig.4 Temperature and humidity cycling

9. SO_2 Gas	
Reference standard:	IEC 60068-2-43
Test conditions:	Solder the receptacle terminal to the test board, then mate plug terminal, and expose them to the following environment in accordance. Temperature: 313K (40℃) Humidity: 80%RH Gas (SO_2): 25 ppm Duration: 500 hours
Pass criteria:	[Contact Resistance] Shall meet 4.1.1. [Appearance] No abnormality adversely affecting the performance shall occur.

4.4. Others

1. Solder ability	
Reference standard:	MIL-STD-202, Method 208.
Test conditions:	Dip the solder tine of the terminal in the solder bath at 518±5K （245±5℃） for 5±0.5seconds after immersing the tine in the flux of RMA or R type for 5 to 10 seconds in accordance with MIL-STD-202, Method 208.
Pass criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Soldering Heat Resistance (Reflow)	
Reference standard:	-
Test conditions:	Reflow temperature profile Fig.9. The number of times of reflow is within 2.
Pass criteria:	No abnormality adversely affecting the performance shall not occur.

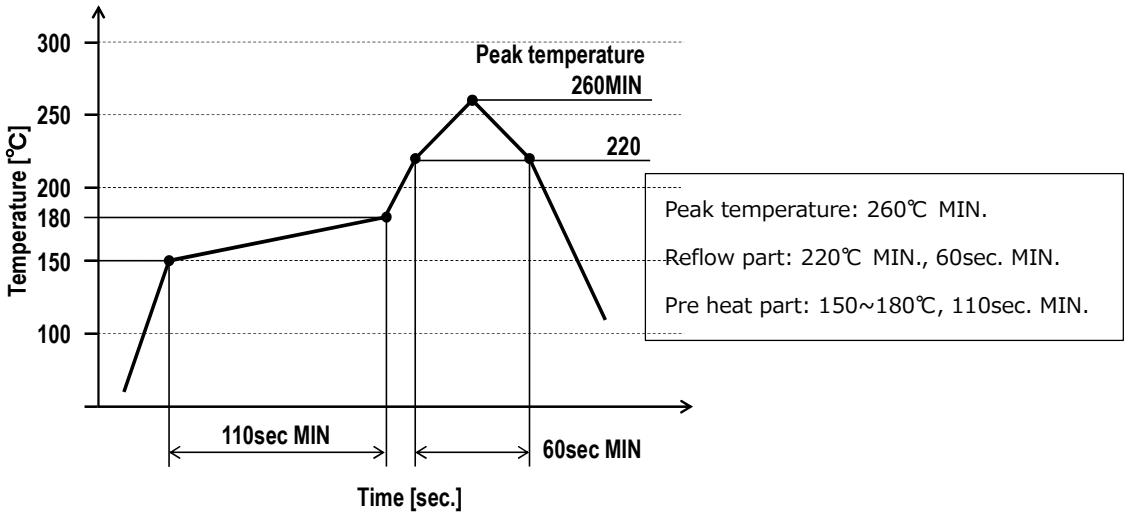
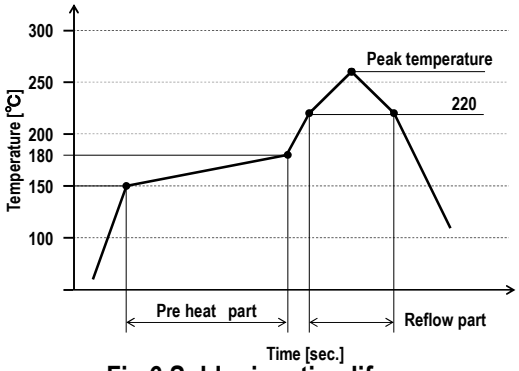


Fig.5 Reflow Temperature Profile

3. Soldering Heat Resistance (Soldering iron)	
Reference standard:	-
Test conditions:	Tip temperature 390℃ or higher. After soldering each terminal for 3 s and 2 times, leave it at room temperature for 30 minutes.
Pass criteria:	No abnormality adversely affecting the performance shall not occur.

4.4. Others

4. Solder junction life	
Reference standard:	IEC 60068-2-14
Test conditions:	Reflow temperature profile Fig.10. The number of times of Reflow is 2. Mate the receptacle and plug connector together and expose them to the following environment in accordance. Temperature：233±5K (-40±5℃),30minutes→ 298K (25℃), 5minutes→ 358±2K (85±2℃),30minutes→ 298K (25℃), 5minutes→ 233±5K (-40±5℃),30minutes Temperature Transition time(Testing machine): Within 5 minutes Duration: 3000 cycles



Peak temperature: 230~245℃ MIN.

Reflow part: 220℃ MIN., 30~60sec

Pre heat part: 150~180℃, 60~110sec. MIN.

Fig.6 Solder junction life

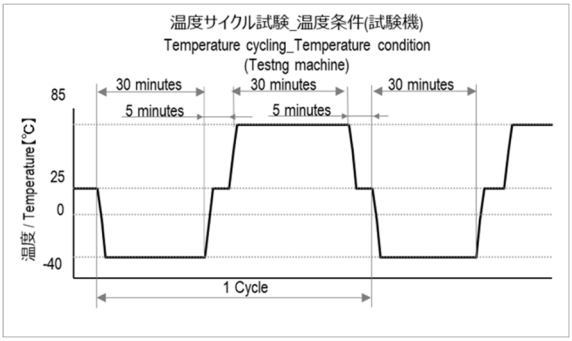


Fig.7 Temperature Transition time (Testing machine)

Pass criteria:	Electrical continuity is confirmed after the test, and no abnormality adversely affecting the performance shall not occur.

4.5 Test Sequence and Specimen Quantity

Table 1 Test Sequence and Sample Quantity

Test Item	Group													
	A	B	C	D	E	F	G	H	J	K	L	M	N	P
Contact Resistance	2,5		1,3	1,3		1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3
Temperature rising		1												
Mating Force/Unmating Force	1,4													
Durability	3													
Vibration			2											
Shock				2										
Electrode fastness test					1									
High Temperature Life						2								
High Temperature Life (Energization)							2							
Low Temperature Life								2						
Low Temperature Life (Energization)									2					
High Temperature and humidity										2				
High Temperature and humidity (Energization)											2			
Temperature cycling												2		
Temperature and humidity cycling													2	
SO_2 Gas														2
Specimen Quantity.	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 Pcs	5 pcs	5 pcs	5 pcs	5 pcs

※Numbers indicate sequence in which tests are performed.

Table 2 Test Sequence and Sample Quantity

Test Item	Group			
	Q	R	S	T
Solder ability	1			
Soldering Heat Resistance (Reflow)		1		
Soldering Heat Resistance (Soldering iron)			1	
Solder junction life				1
Specimen Quantity	5 pcs	5 pcs	5 pcs	5 pcs

※Numbers indicate sequence in which tests are performed.