CABLINE®-CAL IIF

Part No. Plug: 21088-050T-01
Receptacle: 21089-050E-01

Product Specification

Qualification Test Report No. TR-24059

0	S24457	November 8, 2024	R.Hatano	T.Tanigawa	H.Ikari
Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Scope

This product specification defines the test conditions and the performances of the CABLINE-CAL IIF Connector, FPC-to-board connector of 0.4mm contact pitch.

2. Product Name and Parts No.

2.1 Product Name

CABLINE-CAL IIF

2.2 Parts No.

Plug: 21088-050T-01
Receptacle: 21089-050E-01

2.3 Applicable FPC

Shielded FPC Conductor pitch / size of thickness ・・・ 0.4mm /0.25+0.02/-0.03mm
Thermosetting adhesive. Refer to the product drawing (DWG No.21088) for a detail dimension and structure.

3. Rating

3.1 Operating Conditions

Amperage: 0.26A AC/DC (per contact)
Voltage: 100V AC (per contact)
Operating temperature: 233～358K(-40℃～+85℃) (Containing temperature rise by current)
Operating humidity: 85% max

3.2 Storage Conditions

Storage temperature: 248～333K(-25℃～+60℃)
Storage humidity: 85% max. (Non-condensing)

4. Test and Performance

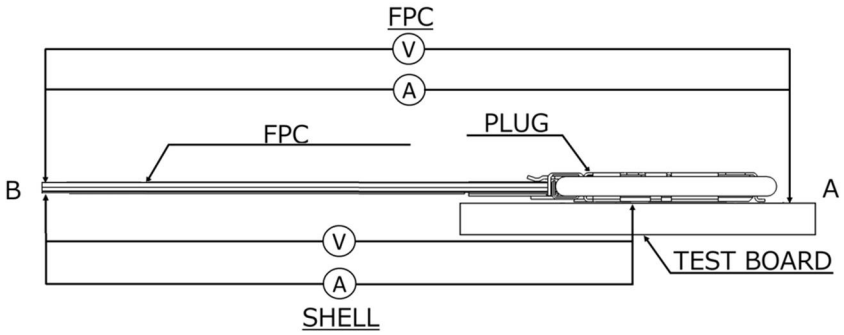
Test Condition

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

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

4.1 Electrical Performance

1. Contact resistance	
Reference standard:	MIL-STD-202-307
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, then apply 20mV MAX. DC open circuit voltage and 10mA MAX. DC closed circuit current. Measure the contact resistance of signal and GROUND(SHELL) at the section shown in Fig.1 by the four terminal methods.



Contact Resistance=R_{AB} – (FPC Conductor Resistance) – (Test Board Conductor Resistance)

Fig.1

Pass criteria:	Signal Contact: Initial: 100 mΩMAX. After testing: ⊿R40 mΩ MAX. Ground Shell: Initial: 100 mΩ MAX. After testing: ⊿R 40 mΩ MAX.

2. Insulation resistance	
Reference standard:	MIL-STD-202-302
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, then apply DC 250 V between the neighboring contacts and between contacts and shell.
Pass criteria:	Initial: 1000 MΩ MIN. After testing: 500 MΩ MIN.

3. Dielectric withstanding voltage	
Reference standard:	MIL-STD-202-301
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, then apply AC 250V(rms) between the neighboring contacts and between contacts and shell for a minute.
Pass criteria:	No creeping discharge, flashover, no insulator breakdown shall occur.

4. Temperature rising	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, and apply rating current per contact. Measure delta T over ambient.
Pass criteria:	Over ambient ⊿T 30 ℃ MAX.

4.2 Mechanical Performance

1. Mating force and Un-mating force	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then place the board and plug on push-on/pull-off machine. Repeat mating/unmating 30 cycles at a speed 25±3mm/min. along the mating axis. Measure the mating and unmating force at the initial and after 30cycles.
Pass criteria:	Mating force: (Initial/After 30cycles) 50P: 15.00 N MAX. Unmating force: (Initial/After 30cycles) 50P: 1.00 N MIN.

2. Durability	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then place the board and plug on the push-on/pull-off machine, and repeat mating and unmating 30cycles at a speed 25±3mm/min. along the mating axis.
Pass criteria:	Contact resistance: Shall meet4.1.1

3. Contact Retention Force	
Reference Standard:	-
Test Conditions:	Place the connector on the push-on/pull-off machine, then apply force on the contact head and push the contact along the direction opposite to the contact insertion at a speed of 25±3 mm/min. Measure the force when the contact dislodges the connector.
Pass Criteria:	Receptacle Contact Retention Force: 0.2N MIN.

4. Connector Lock	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board and mate the plug connector together, and place them on the push-on/pull-off machine, then pull the FPC until 10N along the mating axis at a speed 25±3mm/min.
Pass criteria:	It shall not occur the damage and unlock.

5. Vibration	
Reference standard:	MIL-STD-202-201
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the vibrator. Then apply the following vibration. During the testing, run 100mA DC to check electrical discontinuity. Frequency: 10Hz→55Hz→10Hz/approx. 1min. Directions: 3 mutually perpendicular direction. Total Amplitude: 1.52mm Sweep duration: 2 hours for each direction, a total of 6 hours.
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.

4.2 Mechanical Performance

6. Shock	
Reference standard:	MIL-STD-202-213, Condition A.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the shock machine. Then apply the following shock. MAX.G: 50G Duration: 11msec Wave Form: Half Sinusoidal Directions: 6 mutually perpendicular direction Cycle: 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.

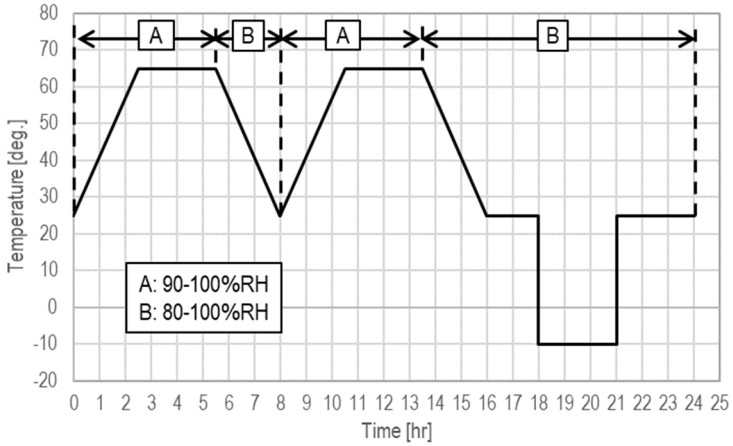
4.3 Environmental Performance

1. Thermal shock	
Reference standard:	MIL-STD-202-107, Condition A.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 218K(-55℃),30min.→358K(85℃),30min. Transition time: 5min. MAX. Cycle: 5 cycles
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

2. High temperature life	
Reference standard:	MIL-STD-202-108, Condition B.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 358±2K (85±2℃) Duration: 250 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

3. Humidity (Steady state)	
Reference standard:	MIL-STD-202-103, Condition A.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 313±2K (40±2℃) Humidity: 90～95%RH Duration: 240 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Insulation resistance: Shall meet 4.1.2. Dielectric withstanding voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

4.3 Environmental Performance

4. Humidity (Cycling)	
Reference standard:	MIL-STD-202-106.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 298[263]～338K (25[-10]～65℃) Humidity: 90～98%RH Duration: 10cycles (240hours)
	
Pass criteria:	Contact resistance: Shall meet 4.1.1. Insulation resistance: Shall meet 4.1.2. Dielectric withstanding voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

5. Salt water spray	
Reference standard:	MIL-STD-202-101, Condition B.
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 308±2K (35±2℃) Salt water density: 5±1% [by weight] Duration: 48 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

6. H_2S gas	
Reference standard:	-
Test conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 313±2K (40±2℃) Relative humidity: 80±5%RH Gas: H_2S 3±1ppm Duration: 48 hours
Pass criteria:	Contact resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

4.4. Others

1. Solderability	
Reference Standard:	-
Test Conditions:	Immerse the contact soldering part to flux of RMA or R type for 5 to 10 seconds, then dip the part into the solder bath of 518±5K （245±5 ℃） for 5±0.5 seconds.
Pass Criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Resistance to Soldering Heat	
Reference Standard:	-
Test Conditions:	Reflow Temperature: See Fig.2. Cycle: 2

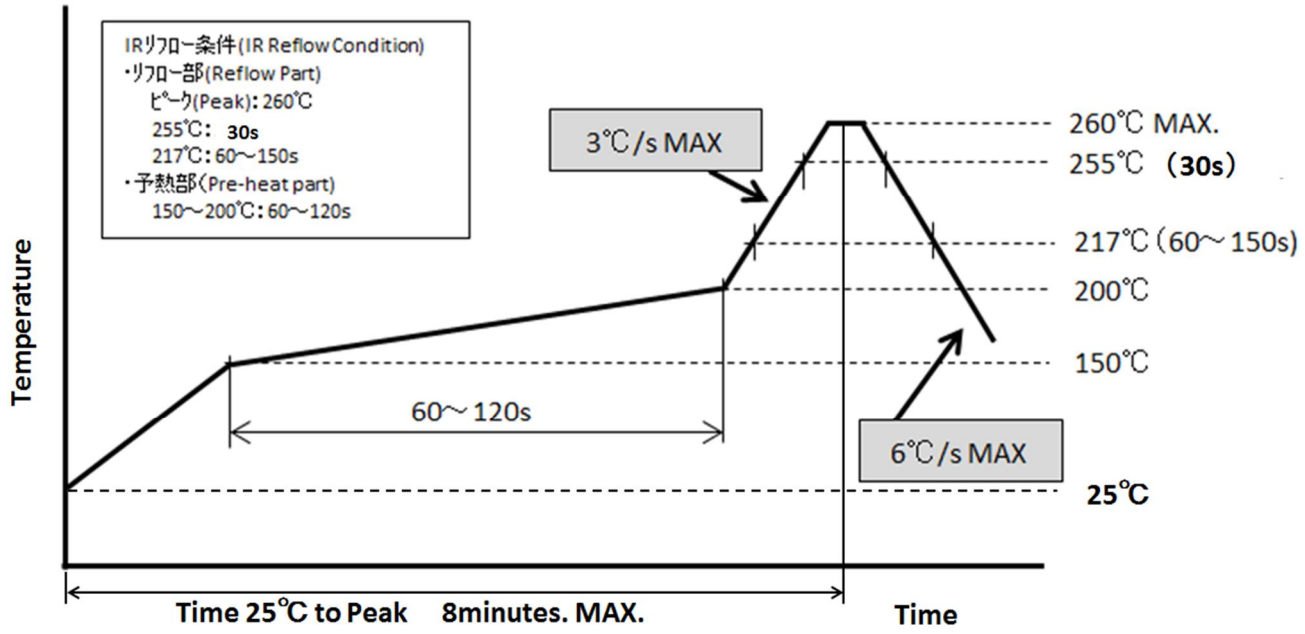


Fig.2

Pass Criteria:	No deformation nor defect adversely affecting the performance occur.

4.4 Test Sequence and Specimen Quantity

Details of the Testing Groups A to K are indicated in test report.

Table.1 Test Sequence and Sample Quantity

No.		Test Item	Testing Groups												
			A	B	C	D	E	F	G	H	J	K	L	M	N
4.1 Electrical Performance	1	Contact resistance		2,6			1,3,5	1,3	1,3	1,5	1,5	1,3	1,3		
	2	Insulation resistance								2,6	2,6				
	3	Dielectric withstanding voltage								3,7	3,7				
	4	Temperature rising	1												
4.2 Mechanical Performance	1	Mating force		1,5											
		Unmating force		3,7											
	2	Durability		4											
	3	Connector retention force			1										
	4	Connector lock				1									
	5	Vibration					2								
	6	Shock					4								
4.3 Environmental Performance	1	Thermal shock						2							
	2	High temperature life							2						
	3	Humidity (Steady State)								4					
	4	Humidity (Cycling)									4				
	5	Saltwater spray										2			
	6	H_2S gas											2		
4.4 Others	1	Solder ability												1	
	2	Soldering heat resistance													1
Specimen quantity			5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	10 pcs	10 pcs

※Numbers indicate test sequences.

5. Recommended Metal Mask

Refer to drawing for the recommended metal mask thickness and opening dimension.

5. Precautions for Handling Cable Connectors

Refer to instruction manual：HIM-24027 for the handling of CABLINE-CAL IIF.