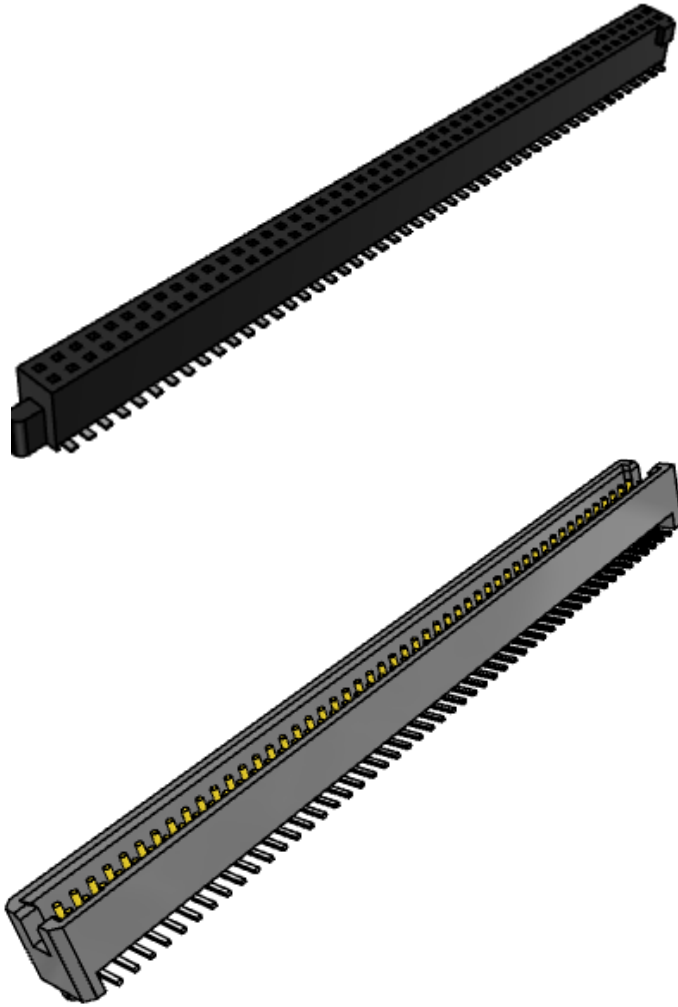




Project Number: SFM/TFM USCAR-2 V2 Shock and Vibration Profile	Tracking Code: CR-1450207_Report_Rev_1
Requested by: Chris Wade	Date: 7/16/2026
Part #: SFM-150-02-S-D\TFM-150-02-S-D	
Part description: SFM\TFM	Tech: Daniel Haydon
Test Start: 5/14/2026	Test Completed: 6/23/2026



SFM/TFM USCAR-2 V2 Shock and Vibration Profile
SFM\TFM
SFM-150-02-S-D\TFM-150-02-S-D

Tracking Code: CR-1450207 Report Rev 1	Part #: SFM-150-02-S-D\TFM-150-02-S-D
Part description: SFM\TFM	

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
7/16/2026	1	Initial Issue	KH

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to ISO 10012-1 and ANSI/NCSL 2540-1, as applicable.

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SCOPE

To perform the following tests: SFM/TFM USCAR-2 V2 Shock and Vibration Profile. Please see test plan.

APPLICABLE DOCUMENTS

Standards: EIA Publication 364, SAE/USCAR-2.

TEST SAMPLES AND PREPARATION

- 1) All materials were manufactured in accordance with the applicable product specification.
- 2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
- 3) After soldering, the parts to be used for LLCR testing were cleaned according to CO-SC-WI-3029.
- 4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
- 5) The automated procedure is used with aqueous compatible soldering materials.
- 6) Parts not intended for testing LLCR are visually inspected and cleaned if necessary.
- 7) Any additional preparation will be noted in the individual test sequences.
- 8) Solder Information: Lead Free
- 9) Samtec Test PCBs used: PCB-107689-TST/PCB-109718-TST/ PCB-115464-TST.

FLOWCHARTS

Mechanical Shock/Random Vibration/LLCR

Group 1

SFM-150-02-S-D

TFM-150-02-S-D

8 Assemblies

Group 2

SFM-150-02-S-D

TFM-150-02-S-DH

8 Assemblies

Step	Description
1.	LLCR ⁽¹⁾
2.	Mechanical Shock ⁽²⁾ - Non Standard
3.	Random Vibration ⁽⁴⁾ - Non Standard <i>Note: Refer to USCAR-2 Table 5.4.6.3D for vibration profile.</i>
4.	Ambient Age <i>Note: Hold at ambient conditions for 48 hours before proceeding with measurements.</i>
5.	LLCR ⁽¹⁾ Max Delta = 15 mOhm
6.	Photos ⁽³⁾

Step	Description
1.	LLCR ⁽¹⁾
2.	Mechanical Shock ⁽²⁾ - Non Standard
3.	Random Vibration ⁽⁴⁾ - Non Standard <i>Note: Refer to USCAR-2 Table 5.4.6.3D for vibration profile.</i>
4.	Ambient Age <i>Note: Hold at ambient conditions for 48 hours before proceeding with measurements.</i>
5.	LLCR ⁽¹⁾ Max Delta = 15 mOhm
6.	Photos ⁽³⁾

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Mechanical Shock = Other

SAE/USCAR-2 Class = V2 (35 G Peak, 5-10 milliseconds, Half Sine)
Number of Shocks = 10 Per Axis, Positive Direction

(3) Photos

Attach 2-3 photos of contact area

(4) Random Vibration = Other

SAE/USCAR-2 Condition = V2 (12.1 gRMS, 60Hz to 1200Hz, 8 Hours/Axis)

Mechanical Shock/Random Vibration/Event Detection

Group 1

SFM-150-02-S-D

TFM-150-02-S-D

60 Points

Group 2

SFM-150-02-S-D

TFM-150-02-S-DH

60 Points

Step	Description
1.	Nanosecond Event Detection (Mechanical Shock) ⁽¹⁾ - Non Standard
2.	Nanosecond Event Detection (Random Vibration) ⁽²⁾ - Non Standard <i>Note: Refer to SAE/USCAR-2 Table 5.4.6.3D for vibration profile.</i>
3.	Photos ⁽³⁾

Step	Description
1.	Nanosecond Event Detection (Mechanical Shock) ⁽¹⁾ - Non Standard
2.	Nanosecond Event Detection (Random Vibration) ⁽²⁾ - Non Standard <i>Note: Refer to SAE/USCAR-2 Table 5.4.6.3D for vibration profile.</i>
3.	Photos ⁽³⁾

(1) Nanosecond Event Detection (Mechanical Shock) = Other

Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)

Use SAE/USCAR-2 for Mechanical Shock:

Test Condition = V2 (35 G Peak, 5 to 10 milliseconds, Half Sine)
Number of Shocks = 10 per Axis, Positive Direction

(2) Nanosecond Event Detection (Random Vibration) = Other

Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)

Use SAE/USCAR-2 for Random Vibration:

Test Condition = V2 (12.1 gRMS, 60Hz to 1200Hz, 8 Hours/Axis)

(3) Photos

Attach 2-3 photos of contact area

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

MECHANICAL SHOCK (Specified Pulse):

- 1) Reference document: SAE/USCAR-2, *Mechanical Shock Test Procedure for Electrical Connectors*
- 2) Test Condition: V2
- 3) Peak Value: 35 G
- 4) Duration: 5-10 Milliseconds
- 5) Wave Form: Half Sine
- 6) Velocity: 12.3 ft/s
- 7) Number of Shocks: 10 per Axis, Positive Direction.

VIBRATION:

- 1) Reference document: SAE/USCAR-2, *Vibration Test Procedure for Electrical Connectors*
- 2) Test Condition: V2
- 3) Power Spectral Density: 0.04 G² / Hz
- 4) G 'RMS': 12.1
- 5) Frequency: 60 to 1200 Hz
- 6) Duration: 8.0 Hours per axis (3 axis total)

NANOSECOND-EVENT DETECTION:

- 1) Reference document: EIA-364-87, *Nanosecond-Event Detection for Electrical Connectors*
- 2) Prior to test, the samples were characterized to ensure the low nanosecond event being monitored will trigger the detector.
- 3) After characterization it was determined the test samples could be monitored for 50 nanosecond events

LLCR:

- 1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 3) The following guidelines are used to categorize the changes in LLCR as a result of stress
 - a. $\leq +5.0$ mOhms: -----Stable
 - b. +5.1 to +10.0 mOhms:-----Minor
 - c. +10.1 to +15.0 mOhms: -----Acceptable
 - d. +15.1 to +50.0 mOhms: -----Marginal
 - e. +50.1 to +1000 mOhms: -----Unstable
 - f. $>+1000$ mOhms:-----Open Failure

RESULTS**LLCR Shock & Vibration (192 LLCR test points)****Group 1**

- Initial -----7.95 mOhms Max
- Shock & Vibration
 - <= +5.0 mOhms -----192 Points ----- Stable
 - +5.1 to +10.0 mOhms -----0 Points ----- Minor
 - +10.1 to +15.0 mOhms -----0 Points ----- Acceptable
 - +15.1 to +50.0 mOhms -----0 Points ----- Marginal
 - +50.1 to +1000 mOhms -----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure

Group 2

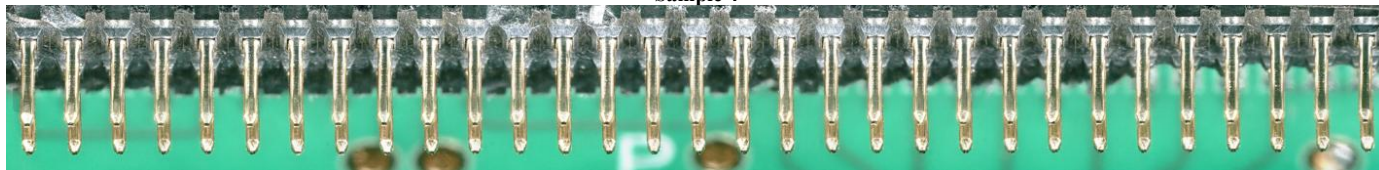
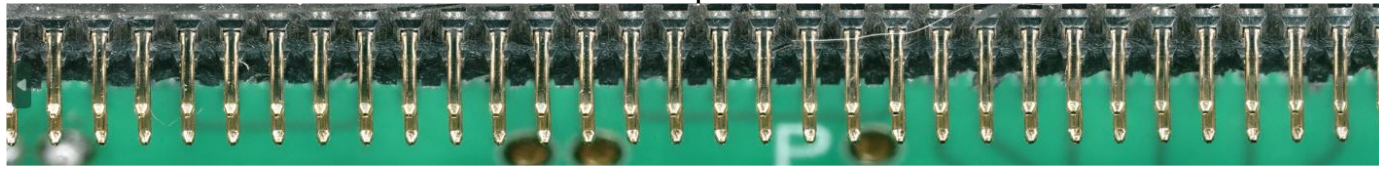
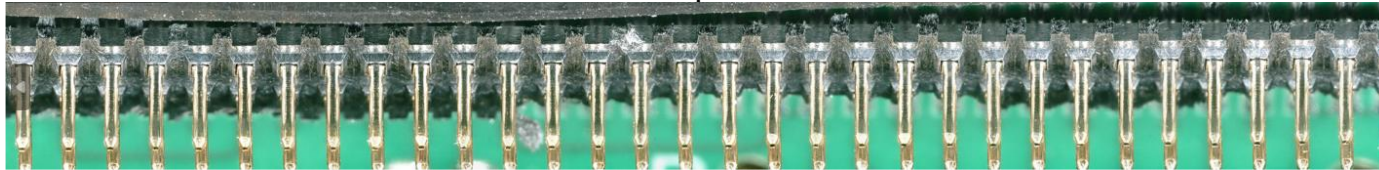
- Initial -----10.97 mOhms Max
- Shock & Vibration
 - <= +5.0 mOhms -----192 Points ----- Stable
 - +5.1 to +10.0 mOhms -----0 Points ----- Minor
 - +10.1 to +15.0 mOhms -----0 Points ----- Acceptable
 - +15.1 to +50.0 mOhms -----0 Points ----- Marginal
 - +50.1 to +1000 mOhms -----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure

Mechanical Shock & Random Vibration:**Group 1**

- Shock
 - No Damage ----- Pass
 - 50 Nanoseconds ----- Pass
- Vibration
 - No Damage ----- Pass
 - 50 Nanoseconds ----- Pass

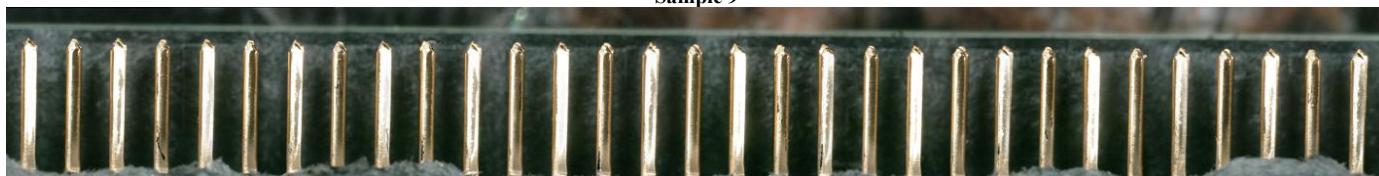
Group 2

- Shock
 - No Damage ----- Pass
 - 50 Nanoseconds ----- Pass
- Vibration
 - No Damage ----- Pass
 - 50 Nanoseconds ----- Pass

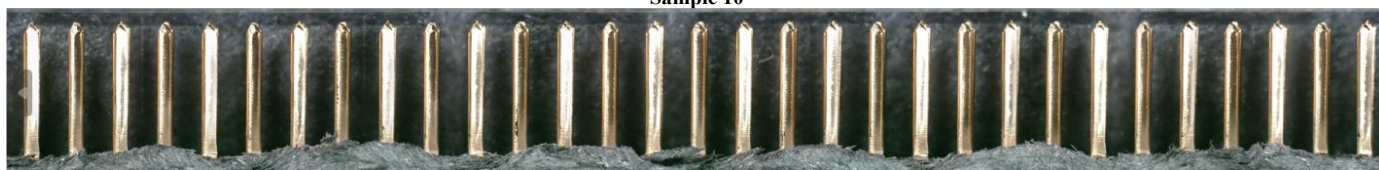
RESULTS continue**Photos:****Group 1****Sample 1****Sample 2****Sample 3****Sample 4****Sample 5****Sample 6****Sample 7****Sample 8**

RESULTS continue**Group 2**

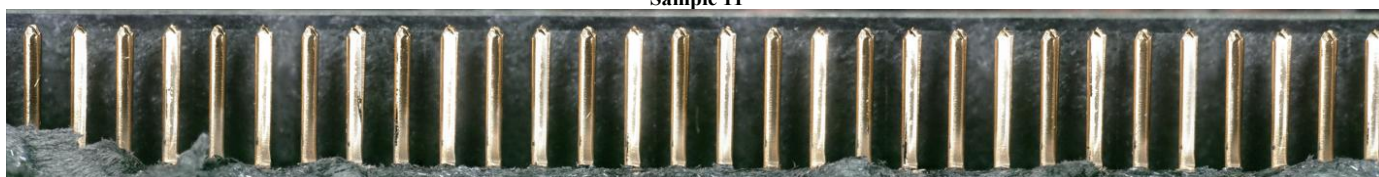
Sample 9



Sample 10



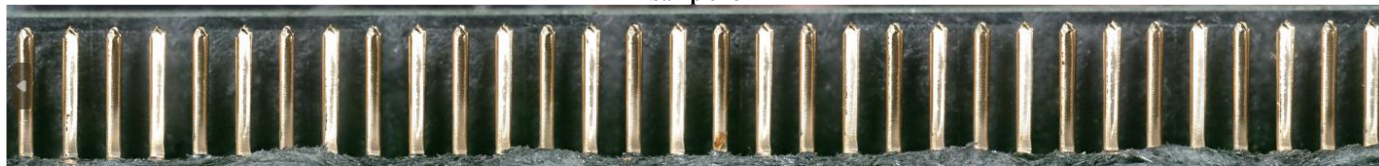
Sample 11



Sample 12



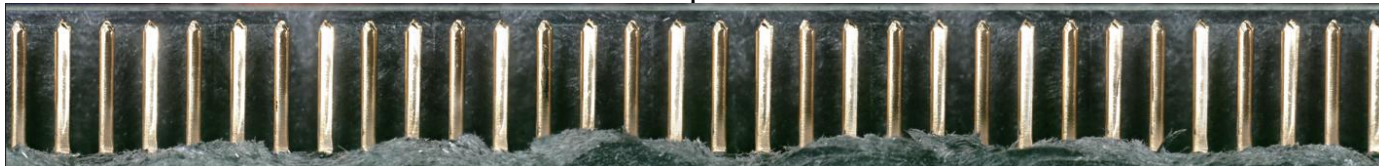
Sample 13



Sample 14



Sample 15



Sample 16



DATA SUMMARIES**LLCR Shock & Vibration:**

- 1). A total of signal 1 192 points were measured.
- 2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms: -----Stable
 - b. $+5.1$ to $+10.0$ mOhms: -----Minor
 - c. $+10.1$ to $+15.0$ mOhms: -----Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: -----Marginal
 - e. $+50.1$ to $+1000$ mOhms: -----Unstable
 - f. $>+1000$ mOhms: -----Open Failure

Group 1

LLCR Measurement Summaries by Pin Type		
Date	2026/5/19	2026/6/19
Room Temp (Deg C)	22	22
Rel Humidity (%)	53	45
Technician	Daniel Haydon	Daniel Haydon
mOhm values	Actual	Delta
	Initial	Shock-Vib
Pin Type: Signal 1		
Average	7.28	0.1
St. Dev.	0.23	0.08
Min	6.74	0
Max	7.95	0.34
Summary Count	192	192
Total Count	192	192

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	$>5 \text{ \& } \leq 10$	$>10 \text{ \& } \leq 15$	$>15 \text{ \& } \leq 50$	$>50 \text{ \& } \leq 1000$	>1000
Shock-Vib	192	0	0	0	0	0

DATA SUMMARIES continue

Group 2

LLCR Measurement Summaries by Pin Type		
Date	2026/5/14	2026/6/23
Room Temp (Deg C)	23	22
Rel Humidity (%)	38	46
Technician	Daniel Haydon	Daniel Haydon
mOhm values	Actual	Delta
	Initial	Shock-Vib
Pin Type: Signal 1		
Average	8.31	0.7
St. Dev.	0.78	0.66
Min	6.57	0
Max	10.97	2.65
Summary Count	192	192
Total Count	192	192

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
Shock-Vib	192	0	0	0	0	0

DATA SUMMARIES continue**Nanosecond Event Detection:****Group 1**

Shock and Vibration Event Detection Summary	
Contacts tested	60
PCB #'s	PCB-107689-TST-01 / PCB-107689-TST-02
Test Condition	V2 35g's, 5-10ms, Half-Sine
Shock Events	0
Test Condition	V2 (12.1 gRMS, 60Hz - 1200Hz) 8 Hours/Axis
Vibration Events	0
Total Events	0

Group 2

Shock and Vibration Event Detection Summary	
Contacts tested	60
PCB #'s	PCB-107689-TST-01 / PCB-107689-TST-02
Test Condition	V2 35g's, 5-10ms, Half-Sine
Shock Events	0
Test Condition	V2 (12.1 gRMS, 60Hz - 1200Hz) 8 Hours/Axis
Vibration Events	0
Total Events	0

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** SVC-01**Description:** Shock & Vibration Table**Manufacturer:** Data Physics**Model:** LE-DSA-10-20K**Serial #:** 10037**Accuracy:** See Manual

... Last Cal: 04/22/2026, Next Cal: 04/22/2027

Equipment #: ACLM-01**Description:** Accelerometer**Manufacturer:** PCB Piezotronics**Model:** 352C03**Serial #:** 115819**Accuracy:** See Manual

... Last Cal: 07/18/2025, Next Cal: 07/18/2026

Equipment #: ED-03**Description:** Event Detector**Manufacturer:** Analysis Tech**Model:** 32EHD**Serial #:** 1100604**Accuracy:** See Manual

... Last Cal: 10/31/2025, Next Cal: 10/31/2026

Equipment #: MO-04**Description:** Multimeter /Data Acquisition System**Manufacturer:** Keithley**Model:** 2700**Serial #:** 0798688**Accuracy:** See Manual

... Last Cal: 09/11/2025, Next Cal: 09/11/2026