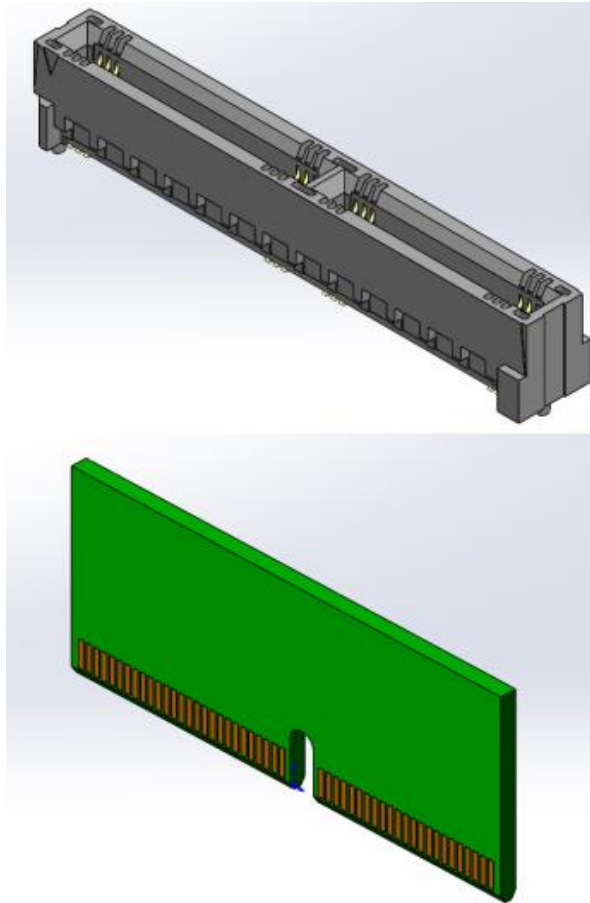




Project Number: Design Qualification Test Report	Tracking Code: CR-713605_Report_Rev_1
Requested by: Tyler Lang	Date: 6/5/2024
Part #: HTEC8-150-01-S-DV-A/EDGE CARD	
Part description: HTEC8 / EDGE CARD	Tech: Keney Chen
Test Start: 6/17/2019	Test Completed: 7/19/2019



**DESIGN QUALIFICATION TEST REPORT**  
**HTEC8 / EDGE CARD**  
**HTEC8-150-01-S-DV-A/EDGE CARD**

Tracking Code: CR-713605_Report_Rev_1	Part #: HTEC8-150-01-S-DV-A/EDGE CARD
Part description: HTEC8 / EDGE CARD	

### REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
6/5/2024	1	Initial test	PC

## 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: Design Qualification test. Please see test plan.

### APPLICABLE DOCUMENTS

Standards: EIA Publication 364

### 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 was 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 is 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-109523-TST.

## FLOWCHARTS

### Extended Life

<u>Group 1</u>		<u>Group 2</u>		<u>Group 3</u>		<u>Group 4</u>	
HTEC8-150-01-S-DV-A 0.068" EDGE CARD 8 Assemblies 100 Cycles		HTEC8-150-01-S-DV-A 0.068" EDGE CARD 8 Assemblies 250 Cycles		HTEC8-150-01-S-DV-A 0.068" EDGE CARD 8 Assemblies 500 Cycles		HTEC8-150-01-S-DV-A 0.068" EDGE CARD 8 Assemblies 1000 Cycles	
Step	Description	Step	Description	Step	Description	Step	Description
1.	Plating Thickness Verification <sup>(4)</sup>	1.	Plating Thickness Verification <sup>(4)</sup>	1.	Plating Thickness Verification <sup>(4)</sup>	1.	Plating Thickness Verification <sup>(4)</sup>
2.	LLCR <sup>(2)</sup>	2.	LLCR <sup>(2)</sup>	2.	LLCR <sup>(2)</sup>	2.	LLCR <sup>(2)</sup>
3.	Cycles Quantity = 100 Cycles	3.	Cycles Quantity = 250 Cycles	3.	Cycles Quantity = 500 Cycles	3.	Cycles Quantity = 1000 Cycles
4.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	4.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	4.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	4.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm
5.	Thermal Shock <sup>(5)</sup>	5.	Thermal Shock <sup>(5)</sup>	5.	Thermal Shock <sup>(5)</sup>	5.	Thermal Shock <sup>(5)</sup>
6.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	6.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	6.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	6.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm
7.	Humidity <sup>(1)</sup>	7.	Humidity <sup>(1)</sup>	7.	Humidity <sup>(1)</sup>	7.	Humidity <sup>(1)</sup>
8.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	8.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	8.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm	8.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm
9.	Photos <sup>(3)</sup>	9.	Photos <sup>(3)</sup>	9.	Photos <sup>(3)</sup>	9.	Photos <sup>(3)</sup>

<u>Group 5</u>	
HTEC8-150-01-S-DV-A 0.068" EDGE CARD 8 Assemblies 2500 Cycles	
Step	Description
1.	Plating Thickness Verification <sup>(4)</sup>
2.	LLCR <sup>(2)</sup>
3.	Cycles Quantity = 2500 Cycles
4.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm
5.	Thermal Shock <sup>(5)</sup>
6.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm
7.	Humidity <sup>(1)</sup>
8.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm
9.	Photos <sup>(3)</sup>

- (1) Humidity = EIA-364-31  
Test Condition = B (240 Hours)  
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)  
Test Exceptions: ambient pre-condition and delete steps 7a and 7b
- (2) LLCR = EIA-364-23  
Open Circuit Voltage = 20 mV Max  
Test Current = 100 mA Max
- (3) Photos  
Attach 2-3 photos of contact area
- (4) Plating Thickness Verification  
Measure, verify, and document plating thickness on both male and female (one group only)  
Plating thickness to be measured on loose pins used during assembly
- (5) Thermal Shock = EIA-364-32  
Exposure Time at Temperature Extremes = 1/2 Hour  
Method A, Test Condition = I (-55°C to +85°C)  
Test Duration = A-3 (100 Cycles)

### ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

#### 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 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

**RESULTS****LLCR Extended Life (192 LLCR test points)****100 Cycles**

- **Initial** ----- 8.81 mOhms Max
- **Durability, 100 Cycles**
  - **<= +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
- **Thermal**
  - **<= +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
- **Humidity**
  - **<= +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

**250 Cycles**

- **Initial** ----- 11.23 mOhms Max
- **Durability, 250 Cycles**
  - **<= +5.0 mOhms**----- 191 Points ----- Stable
  - **+5.1 to +10.0 mOhms** ----- 1 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
- **Thermal**
  - **<= +5.0 mOhms**----- 191 Points ----- Stable
  - **+5.1 to +10.0 mOhms** ----- 1 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
- **Humidity**
  - **<= +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

**RESULTS Continued****500 Cycles**

- **Initial** ----- 10.06 mOhms Max
- **Durability, 500 Cycles**
  - **<= +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
- **Thermal**
  - **<= +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
- **Humidity**
  - **<= +5.0 mOhms**-----189 Points ----- Stable
  - **+5.1 to +10.0 mOhms**-----3 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

**1000 Cycles**

- **Initial** ----- 10.68 mOhms Max
- **Durability, 1000 Cycles**
  - **<= +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
- **Thermal**
  - **<= +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
- **Humidity**
  - **<= +5.0 mOhms**-----184 Points ----- Stable
  - **+5.1 to +10.0 mOhms**-----8 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

**RESULTS Continued**

**2500 Cycles**

- **Initial** -----9.54 mOhms Max
- **Durability, 2500 Cycles**
  - **<= +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
- **Thermal**
  - **<= +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
- **Humidity**
  - **<= +5.0 mOhms**-----191 Points ----- Stable
  - **+5.1 to +10.0 mOhms**-----1 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

**DATA SUMMARIES**

**LLCR Extended Life:**

- 1) A total of 192 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) 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

**100 Cycles**

<b>LLCR Measurement Summaries by Pin Type</b>				
Date	6/17/2019	6/19/2019	6/24/2019	7/17/2019
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	50	50	50	45
Technician	Keney Chen	Keney Chen	Keney Chen	Keney Chen
<b>mOhm values</b>	<b>Actual</b>	<b>Delta</b>	<b>Delta</b>	<b>Delta</b>
	<b>Initial</b>	<b>100 Cycles</b>	<b>Therm Shck</b>	<b>Humidity</b>
<b>Pin Type 1: Signal</b>				
Average	7.12	0.58	0.67	0.76
St. Dev.	0.68	0.48	0.54	0.75
Min	5.32	0.01	0.00	0.00
Max	8.81	2.45	2.81	4.06
Summary Count	192	192	192	192
Total Count	192	192	192	192

<b>LLCR Delta Count by Category</b>						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	$\leq 5$	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	$>1000$
<b>100 Cycles</b>	192	0	0	0	0	0
<b>Therm Shck</b>	192	0	0	0	0	0
<b>Humidity</b>	192	0	0	0	0	0

**DATA SUMMARIES Continued****250 Cycles**

<b>LLCR Measurement Summaries by Pin Type</b>				
Date	6/17/2019	6/19/2019	6/24/2019	7/17/2019
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	50	50	50	45
Technician	Keney Chen	Keney Chen	Keney Chen	Keney Chen
<b>mOhm values</b>	<b>Actual Initial</b>	<b>Delta 250 Cycles</b>	<b>Delta Therm Shck</b>	<b>Delta Humidity</b>
<b>Pin Type 1: Signal</b>				
Average	7.57	1.07	1.01	0.89
St. Dev.	1.08	0.89	0.86	0.79
Min	5.74	0.00	0.02	0.02
Max	11.23	5.14	5.54	4.60
Summary Count	192	192	192	192
Total Count	192	192	192	192

<b>LLCR Delta Count by Category</b>						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
<b>250 Cycles</b>	191	1	0	0	0	0
<b>Therm Shck</b>	191	1	0	0	0	0
<b>Humidity</b>	192	0	0	0	0	0

**DATA SUMMARIES Continued**

**500 Cycles**

<i>LLCR Measurement Summaries by Pin Type</i>					
	Date	6/17/2019	6/20/2019	7/1/2019	7/17/2019
Room Temp (Deg C)		23	23	23	23
Rel Humidity (%)		50	50	50	45
Technician		Keney Chen	Keney Chen	Keney Chen	Keney Chen
<b>mOhm values</b>		<b>Actual Initial</b>	<b>Delta 500 Cycles</b>	<b>Delta Therm Shck</b>	<b>Delta Humidity</b>
<i>Pin Type 1: Signal</i>					
Average		7.39	1.01	0.99	0.89
St. Dev.		0.84	0.73	0.75	1.01
Min		5.64	0.01	0.03	0.01
Max		10.06	3.97	3.61	7.23
Summary Count		192	192	192	192
Total Count		192	192	192	192

<i>LLCR Delta Count by Category</i>						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
<b>500 Cycles</b>	<b>192</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Therm Shck</b>	<b>192</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Humidity</b>	<b>189</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**DATA SUMMARIES Continued**

**1000 Cycles**

<i>LLCR Measurement Summaries by Pin Type</i>					
	Date	6/17/2019	6/20/2019	7/1/2019	7/17/2019
	Room Temp (Deg C)	23	23	23	23
	Rel Humidity (%)	50	50	50	45
	Technician	Keney Chen	Keney Chen	Keney Chen	Keney Chen
	mOhm values	<b>Actual</b>	<b>Delta</b>	<b>Delta</b>	<b>Delta</b>
		<b>Initial</b>	<b>1000 Cycles</b>	<b>Therm Shck</b>	<b>Humidity</b>
<b>Pin Type 1: Signal</b>					
	Average	6.99	1.01	0.93	1.15
	St. Dev.	0.81	0.69	0.66	1.52
	Min	5.26	0.00	0.02	0.01
	Max	10.68	4.58	4.58	8.91
	Summary Count	192	192	192	192
	Total Count	192	192	192	192

<i>LLCR Delta Count by Category</i>						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
<b>1000 Cycles</b>	<b>192</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Therm Shck</b>	<b>192</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Humidity</b>	<b>184</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**DATA SUMMARIES Continued**

**2500 Cycles**

<i>LLCR Measurement Summaries by Pin Type</i>					
	Date	6/18/2019	6/24/2019	7/1/2019	7/17/2019
Room Temp (Deg C)		23	23	23	23
Rel Humidity (%)		50	50	50	45
Technician		Keney Chen	Keney Chen	Keney Chen	Keney Chen
mOhm values		<b>Actual Initial</b>	<b>Delta 2500 Cycles</b>	<b>Delta Therm Shck</b>	<b>Delta Humidity</b>
<i>Pin Type 1: Signal</i>					
Average		7.06	1.19	1.17	0.91
St. Dev.		0.77	0.69	0.65	0.72
Min		5.72	0.00	0.03	0.01
Max		9.54	3.54	3.71	6.78
Summary Count		192	192	192	192
Total Count		192	192	192	192

<i>LLCR Delta Count by Category</i>						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
<b>2500 Cycles</b>	192	0	0	0	0	0
<b>Therm Shck</b>	192	0	0	0	0	0
<b>Humidity</b>	191	1	0	0	0	0

**EQUIPMENT AND CALIBRATION SCHEDULES****Equipment #:** HZ-TCT-01**Description:** Normal force analyzer**Manufacturer:** Mecmesin Multitester**Model:** Mecmesin Multitester 2.5-i**Serial #:** 08-1049-04**Accuracy:** Last Cal: 4/26/2024, Next Cal: 4/25/2025**Equipment #:** HZ-MO-05**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 1285188**Accuracy:** Last Cal: 11/15/2023, Next Cal: 11/14/2024