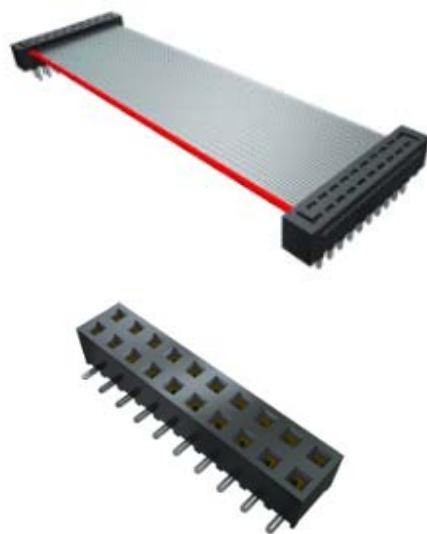




Project Number: Design Qualification Test Report	Tracking Code: 985371_Report_Rev_1
Requested by: Donnie Baldwin	Date: 3/1/2017
Part #: TCMD-25-D-06.00-01/SMM-125-02-L-D-TR	
Part description: TCMD/SMM	Tech: Donnie Baldwin
Test Start: 10/25/2016	Test Completed: 11/14/2016



## **DESIGN QUALIFICATION TEST REPORT**

**TCMD/SMM**  
**TCMD-25-D-06.00-01/SMM-125-02-L-D-TR**

Tracking Code: 985371 Report Rev_1	Part #: TCMD-25-D-06.00-01/SMM-125-02-L-D-TR
Part description: TCMD/SMM	

## REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
3/1/2017	1	Initial Issue	KH

Tracking Code: 985371 Report Rev_1	Part #: TCMD-25-D-06.00-01/SMM-125-02-L-D-TR
Part description: TCMD/SMM	

## 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) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
- 4) The automated procedure is used with aqueous compatible soldering materials.
- 5) Any additional preparation will be noted in the individual test sequences.
- 6) Solder Information: Lead Free
- 7) Samtec Test PCBs used: PCB-107794-TST/

## FLOWCHARTS

### IR/DWV

*Note: TCMD to be soldered to PCB  
SMM not to be soldered to PCB*

#### Pin-to-Pin

##### Group 1

TCMD-25-D-06.00-01

SMM-125-02-L-D-TR

2 Assemblies

---

#### Step Description

1. IR<sup>(3)</sup>
2. DWV at Test Voltage<sup>(1)</sup>  
Test Voltage = 900 V
3. Thermal Shock<sup>(4)</sup>
4. IR<sup>(3)</sup>
5. DWV at Test Voltage<sup>(1)</sup>  
Test Voltage = 900 V
6. Humidity<sup>(2)</sup>
7. IR<sup>(3)</sup>
8. DWV at Test Voltage<sup>(1)</sup>  
Test Voltage = 900 V

---

#### Row-to-Row

##### Group 2

TCMD-25-D-06.00-01

SMM-125-02-L-D-TR

2 Assemblies

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#### Step Description

1. IR<sup>(3)</sup>
2. DWV at Test Voltage<sup>(1)</sup>  
Test Voltage = 900 V
3. Thermal Shock<sup>(4)</sup>
4. IR<sup>(3)</sup>
5. DWV at Test Voltage<sup>(1)</sup>  
Test Voltage = 900 V
6. Humidity<sup>(2)</sup>
7. IR<sup>(3)</sup>
8. DWV at Test Voltage<sup>(1)</sup>  
Test Voltage = 900 V

---

(1) DWV at Test Voltage = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(2) 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

(3) IR = EIA-364-21

Test Condition = 500 Vdc, 2 Minutes Max

(4) 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)

## FLOWCHARTS Continued

### Current Carrying Capacity

*Note: TCMD to be soldered to PCB*

<u>Group 1</u> TCMD-25-D-06.00-01		<u>Group 2</u> TCMD-25-D-06.00-01		<u>Group 3</u> TCMD-25-D-06.00-01		<u>Group 4</u> TCMD-25-D-06.00-01	
Step	Description	Step	Description	Step	Description	Step	Description
1.	CCC <sub>(1)</sub> Rows = 2 Number of Positions = 1	1.	CCC <sub>(1)</sub> Rows = 2 Number of Positions = 2	1.	CCC <sub>(1)</sub> Rows = 2 Number of Positions = 3	1.	CCC <sub>(1)</sub> Rows = 2 Number of Positions = 4
<hr/>							
<u>Group 5</u> TCMD-25-D-06.00-01 <hr/> 50 Pins Powered Signal							
Step	Description						
1.	CCC <sub>(1)</sub> Rows = 2 Number of Positions = 25						

(1) CCC = EIA-364-70

Method 2, Temperature Rise Versus Current Curve

(TIN PLATING) - Tabulate calculated current at RT, 65°C, 75°C and 95°C after derating 20% and based on 105°C

(GOLD PLATING) - Tabulate calculated current at RT, 85°C, 95°C and 115°C after derating 20% and based on 125°C

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### **THERMAL SHOCK:**

- 1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors*.
- 2) Test Condition:  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- 3) Test Time:  $\frac{1}{2}$  hour dwell at each temperature extreme
- 4) Number of Cycles: 100
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

### **HUMIDITY:**

- 1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors*.
- 2) Test Condition B, 240 Hours.
- 3) Method III,  $+25^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$ , 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
- 4) All samples are pre-conditioned at ambient.
- 5) All test samples are exposed to environmental stressing in the mated condition.

### **TEMPERATURE RISE (Current Carrying Capacity, CCC):**

- 1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
- 2) When current passes through a contact, the temperature of the contact increases as a result of  $I^2R$  (resistive) heating.
- 3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
- 4) The size of the temperature probe can affect the measured temperature.
- 5) Copper traces on PC boards will contribute to temperature rise:
  - a. Self heating (resistive)
  - b. Reduction in heat sink capacity affecting the heated contacts
- 6) A de-rating curve, usually 20%, is calculated.
- 7) Calculated de-rated currents at four temperature points are reported:
  - a. Ambient
  - b.  $65^{\circ}\text{C}$
  - c.  $75^{\circ}\text{C}$
  - d.  $95^{\circ}\text{C}$
- 8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
- 9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
- 10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
- 11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
- 12) Hook-up wire length is longer than the minimum specified in the referencing standard.

**ATTRIBUTE DEFINITIONS Continued**

The following is a brief, simplified description of attributes

**INSULATION RESISTANCE (IR):**

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

- 1) PROCEDURE:
  - a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
  - b. Test Conditions:
    - i. Between Adjacent Contacts or Signal-to-Ground
    - ii. Electrification Time 2.0 minutes
    - iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
- 2) MEASUREMENTS:
- 3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

**DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

To determine if the sockets can operate at its rated voltage and withstand momentary over potentials due to switching, surges, and other similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

- 1) PROCEDURE:
  - a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
  - b. Test Conditions:
    - i. Between Adjacent Contacts or Signal-to-Ground
    - ii. Barometric Test Condition 1
    - iii. Rate of Application 500 V/Sec
    - iv. Test Voltage (VAC) until breakdown occurs
- 2) MEASUREMENTS/CALCULATIONS
  - a. The breakdown voltage shall be measured and recorded.
  - b. The dielectric withstand voltage shall be recorded as 75% of the minimum breakdown voltage.
  - c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstand voltage (one-fourth of the breakdown voltage).

## RESULTS

### Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise-----2.6 A per contact with 2 contacts (2x1) powered
- CCC for a 30°C Temperature Rise-----2.1 A per contact with 4 contacts (2x2) powered
- CCC for a 30°C Temperature Rise-----1.9 A per contact with 6 contacts (2x3) powered
- CCC for a 30°C Temperature Rise-----1.8 A per contact with 8 contacts (2x4) powered
- CCC for a 30°C Temperature Rise-----1.3 A per contact with 50 contacts (2x25) powered

### Insulation Resistance minimums, IR

#### Pin to Pin

- Initial
  - Mated-----45000 Meg Ω ----- Passed
  - Unmated -----45000 Meg Ω ----- Passed
- Thermal Shock
  - Mated-----45000 Meg Ω ----- Passed
  - Unmated -----45000 Meg Ω ----- Passed
- Humidity
  - Mated-----45000 Meg Ω ----- Passed
  - Unmated -----45000 Meg Ω ----- Passed

#### Row to Row

- Initial
  - Mated-----45000 Meg Ω ----- Passed
  - Unmated -----45000 Meg Ω ----- Passed
- Thermal Shock
  - Mated-----45000 Meg Ω ----- Passed
  - Unmated -----45000 Meg Ω ----- Passed
- Humidity
  - Mated-----45000 Meg Ω ----- Passed
  - Unmated -----45000 Meg Ω ----- Passed

### Dielectric Withstanding Voltage minimums, DWV

- Minimums
  - Breakdown Voltage-----1200 VAC
  - Test Voltage-----900 VAC
  - Working Voltage-----300 VAC

#### Pin to Pin

- Initial DWV ----- Passed
- Thermal DWV-----Passed
- Humidity DWV-----Passed

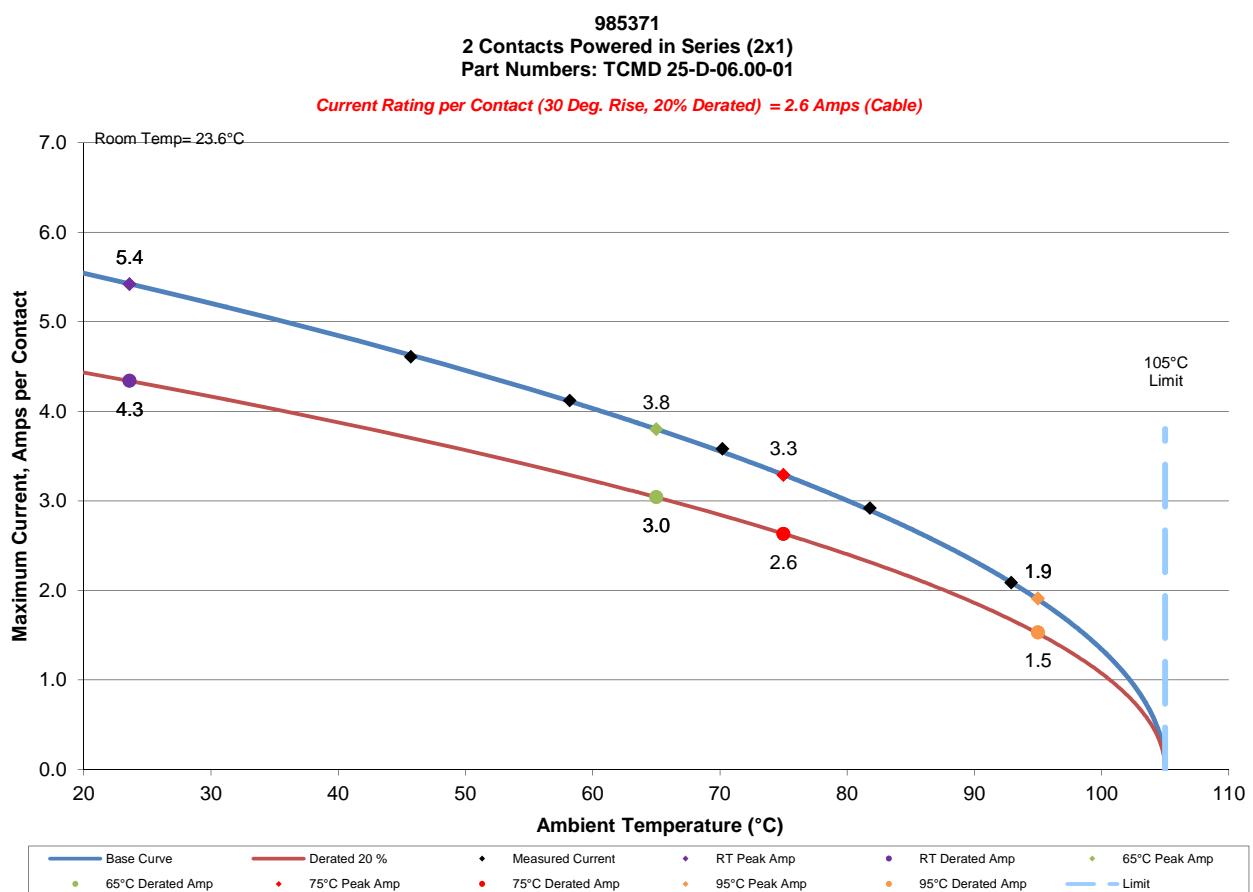
#### Row to Row

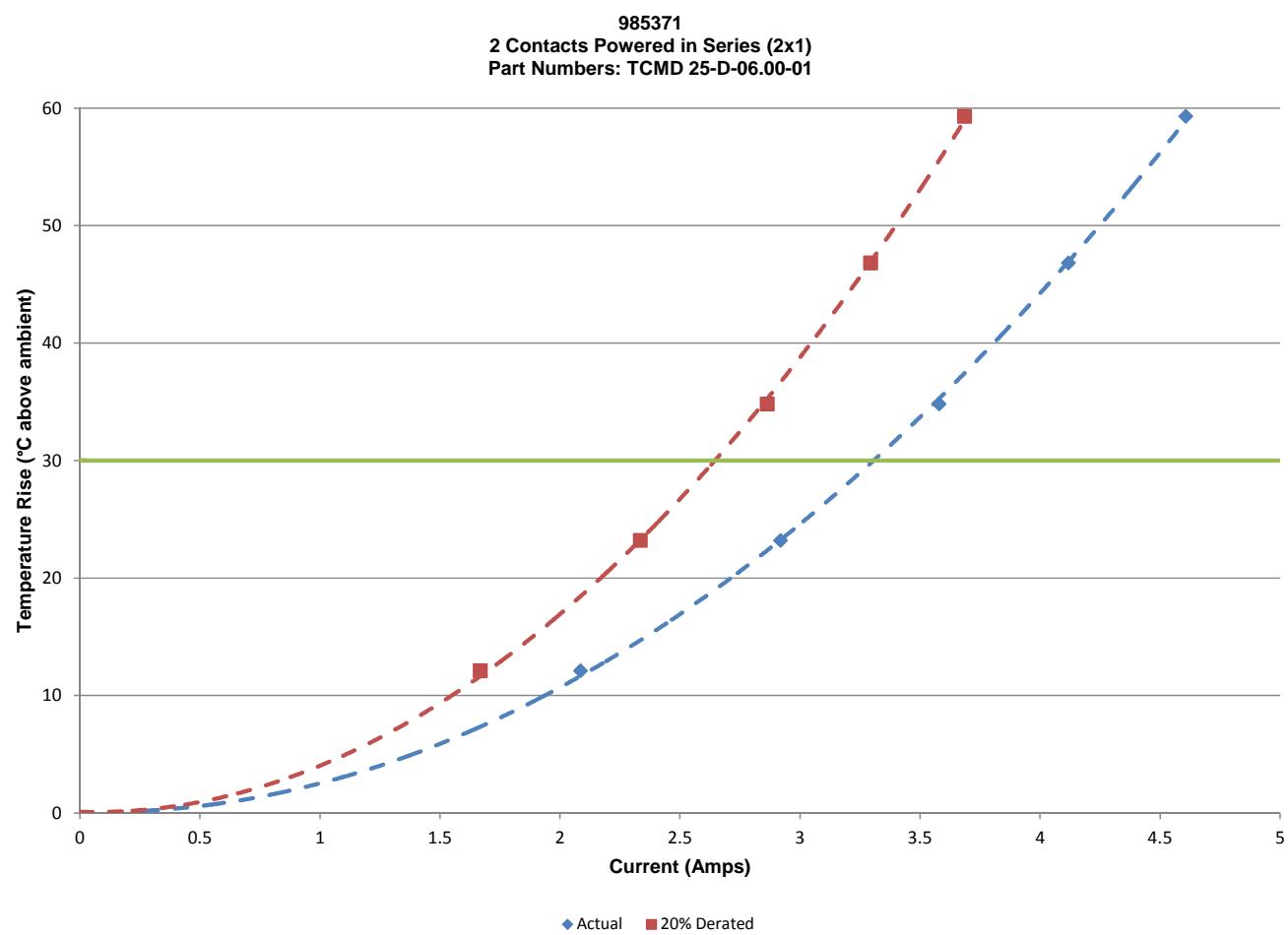
- Initial DWV ----- Passed
- Thermal DWV-----Passed
- Humidity DWV-----Passed

## DATA SUMMARIES

### TEMPERATURE RISE (Current Carrying Capacity, CCC):

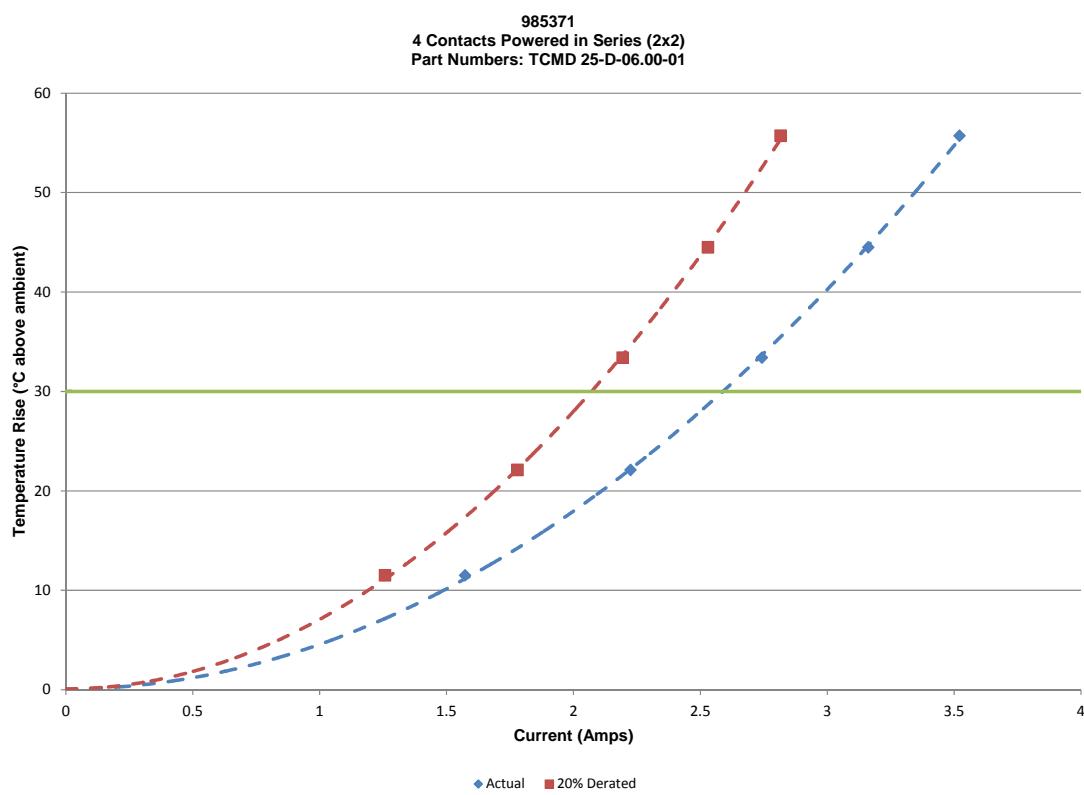
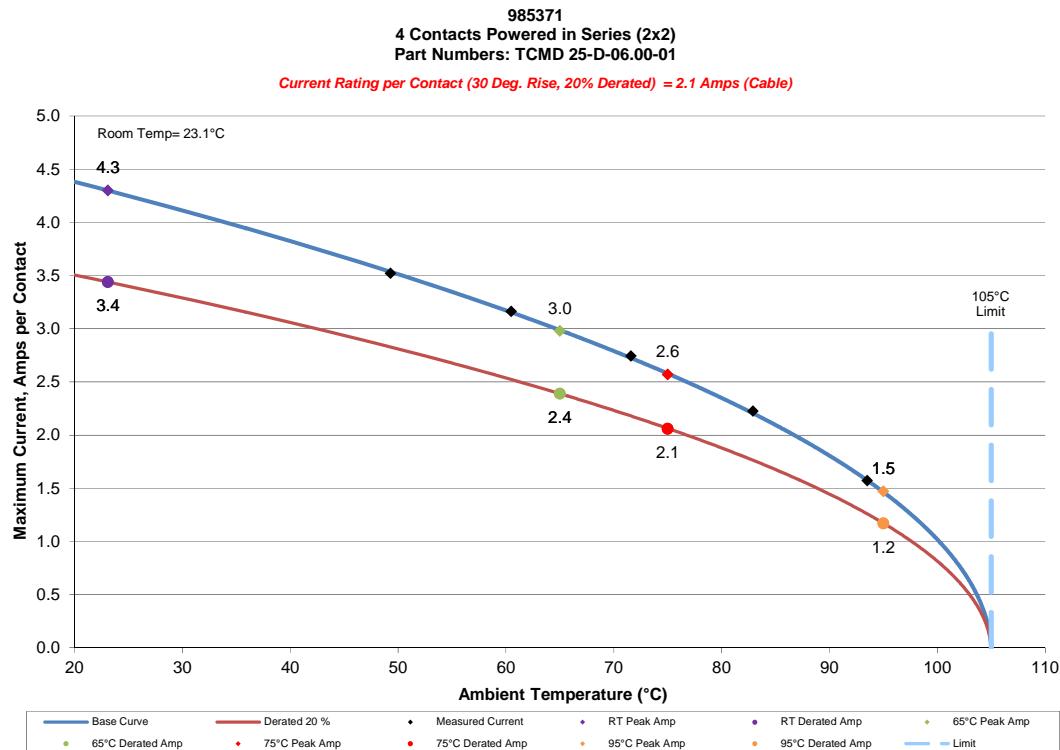
- 1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
- 2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
- 3) Temperature readings recorded are those for which three successive readings, 15 minutes apart, differ less than 1°C (computer controlled data acquisition).
- 4) Adjacent contacts were powered:
  - a. Linear configuration with 2 adjacent conductors/contacts powered





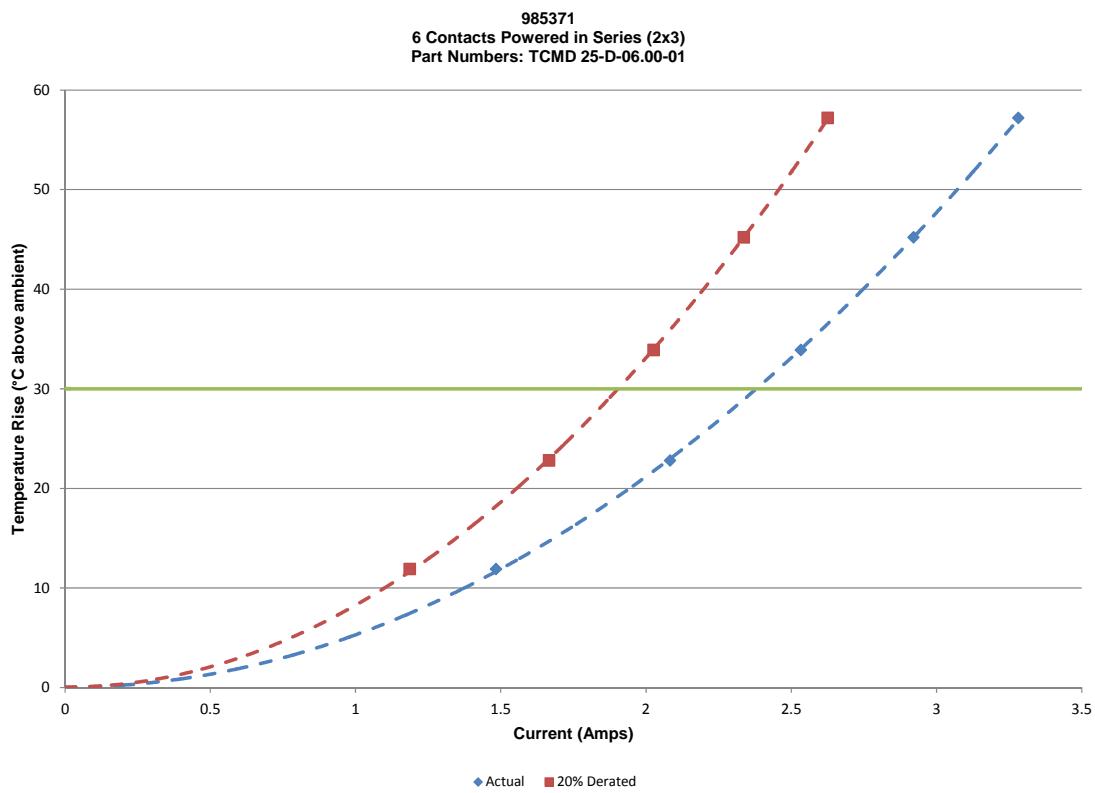
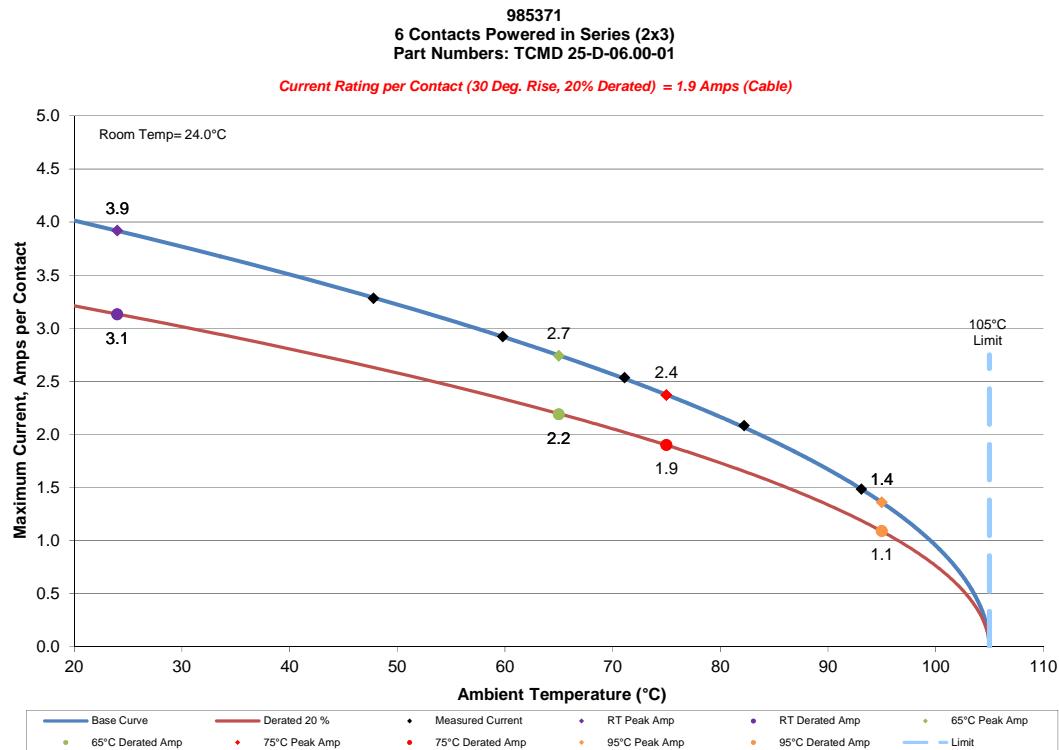
## DATA SUMMARIES Continued

b. Linear configuration with 4 adjacent conductors/contacts powered



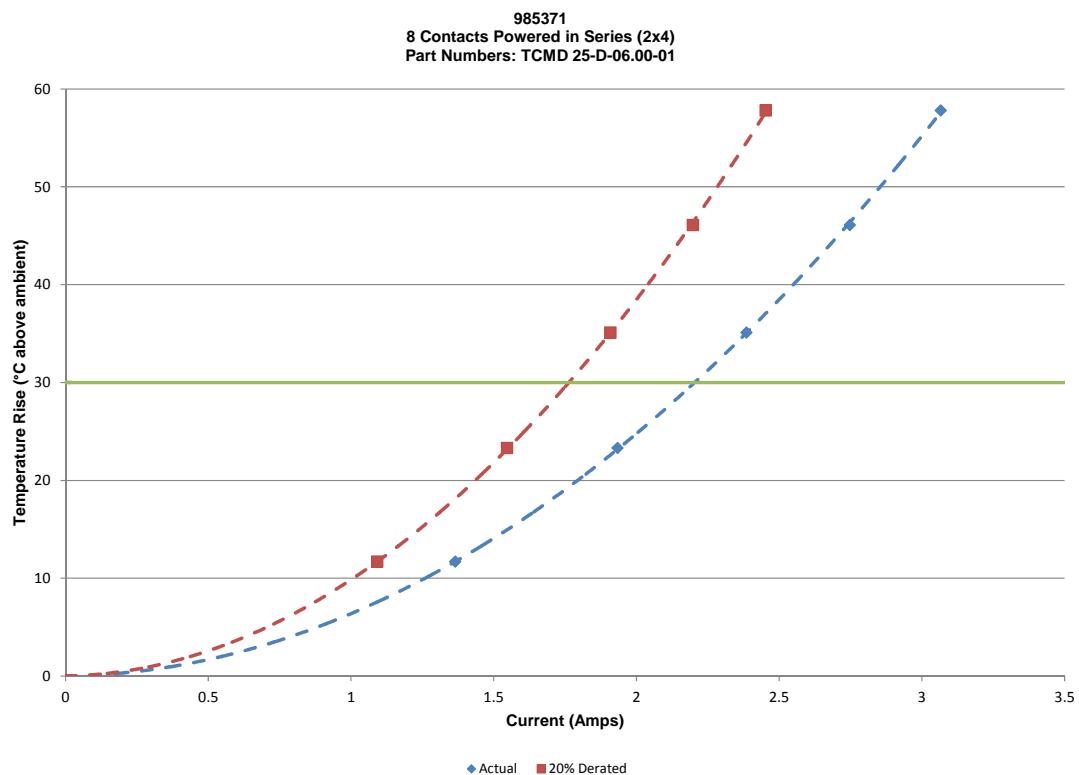
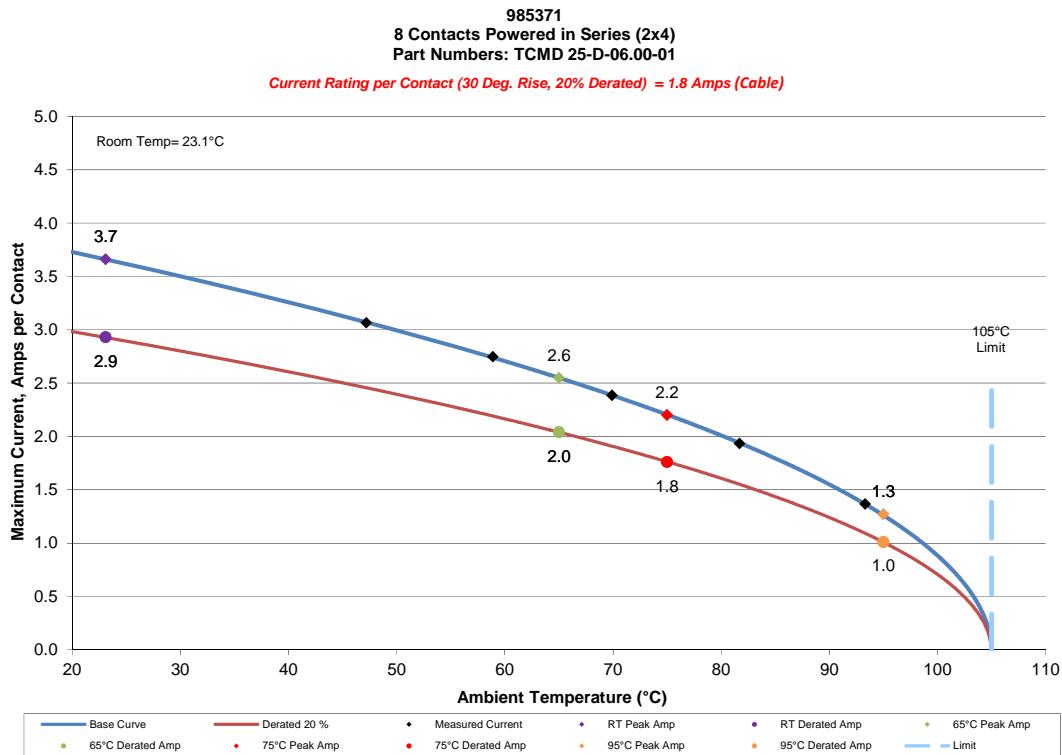
## DATA SUMMARIES Continued

### c. Linear configuration with 6 adjacent conductors/contacts powered



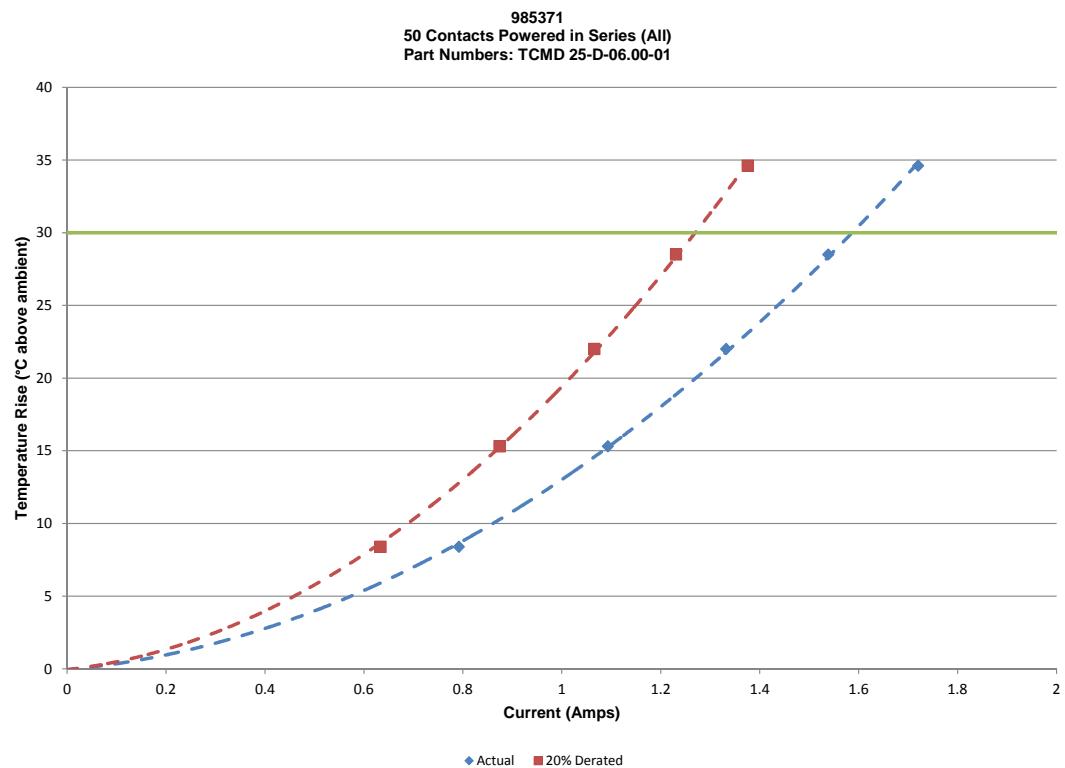
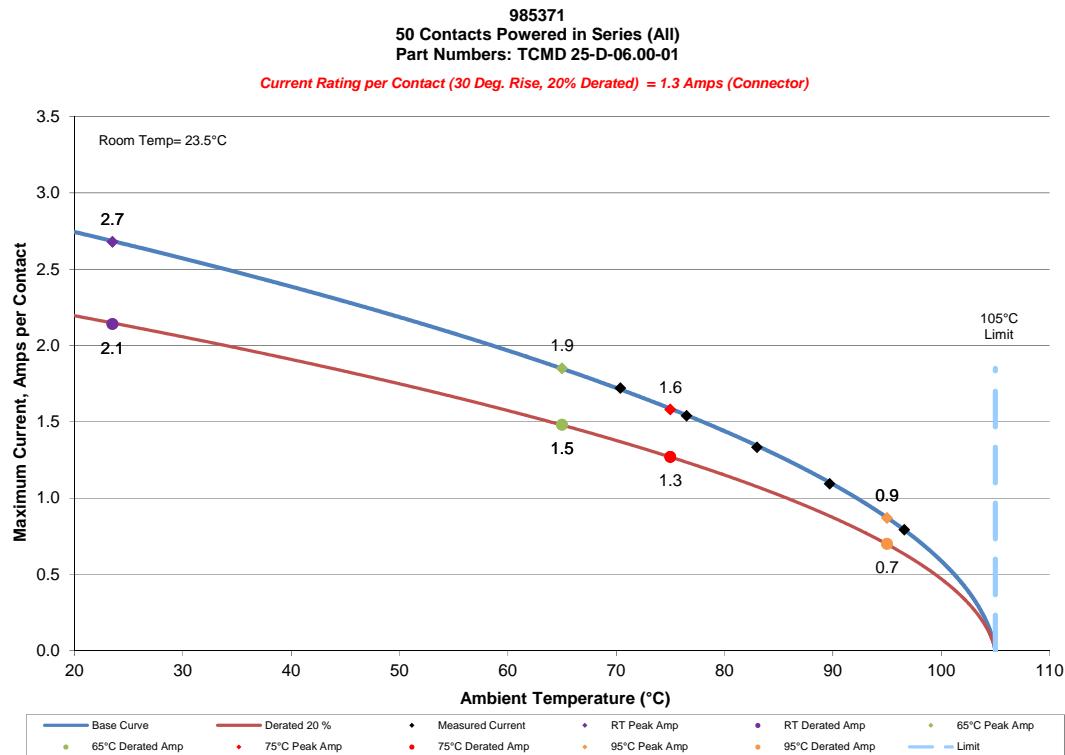
## DATA SUMMARIES Continued

### d. Linear configuration with 8 adjacent conductors/contacts powered



## DATA SUMMARIES Continued

### e. Linear configuration with all adjacent conductors/contacts powered



## DATA SUMMARIES Continued

### INSULATION RESISTANCE (IR):

		Pin to Pin		
		Mated	Unmated	Unmated
Minimum	TCMD/SMM	TCMD	SMM	
<b>Initial</b>	45000	45000	Not Tested	
<b>Thermal</b>	45000	45000	Not Tested	
<b>Humidity</b>	45000	45000	Not Tested	

		Row to Row		
		Mated	Unmated	Unmated
Minimum	TCMD/SMM	TCMD	SMM	
<b>Initial</b>	45000	45000	Not Tested	
<b>Thermal</b>	45000	45000	Not Tested	
<b>Humidity</b>	45000	45000	Not Tested	

### DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	TCMD/SMM
<b>Break Down Voltage</b>	1200
<b>Test Voltage</b>	900
<b>Working Voltage</b>	300

Pin to Pin	
<b>Initial Test Voltage</b>	Passed
<b>After Thermal Test Voltage</b>	Passed
<b>After Humidity Test Voltage</b>	Passed

Row to Row	
<b>Initial Test Voltage</b>	Passed
<b>After Thermal Test Voltage</b>	Passed
<b>After Humidity Test Voltage</b>	Passed

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Part description: TCMD/SMM	

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** THC-05

**Description:** Temperature/Humidity Chamber (Chamber Room)

**Manufacturer:** Thermotron

**Model:** SM-8-3800

**Serial #:** 05 23 00 02

**Accuracy:** See Manual

... Last Cal: 11/14/2016, Next Cal: 05/31/2017

**Equipment #:** TSC-01

**Description:** Vertical Thermal Shock Chamber

**Manufacturer:** Cincinnati Sub Zero

**Model:** VTS-3-6-6-SC/AC

**Serial #:** 10-VT14993

**Accuracy:** See Manual

... Last Cal: 06/30/2016, Next Cal: 06/30/2017

**Equipment #:** HPT-01

**Description:** Hipot Safety Tester

**Manufacturer:** Vitrek

**Model:** V73

**Serial #:** 019808

**Accuracy:**

... Last Cal: 05/15/2016, Next Cal: 05/15/2017

**Equipment #:** PS-02

**Description:** Power Supply

**Manufacturer:** Hewlett-Packer

**Model:** 6033A

**Serial #:** N/A

**Accuracy:** See Manual

... Last Cal: NOT CALIBRATED

**Equipment #:** MO-04

**Description:** Multimeter /Data Acquisition System

**Manufacturer:** Keithley

**Model:** 2700

**Serial #:** 0798688

**Accuracy:** See Manual

... Last Cal: 09/11/2016, Next Cal: 09/11/2017

Tracking Code: 985371 Report Rev_1	Part #: TCMD-25-D-06.00-01/SMM-125-02-L-D-TR
Part description: TCMD/SMM	

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** MO-04

**Description:** Multimeter /Data Acquisition System

**Manufacturer:** Keithley

**Model:** 2700

**Serial #:** 0798688

**Accuracy:** See Manual

... Last Cal: 09/11/2015, Next Cal: 09/11/2016