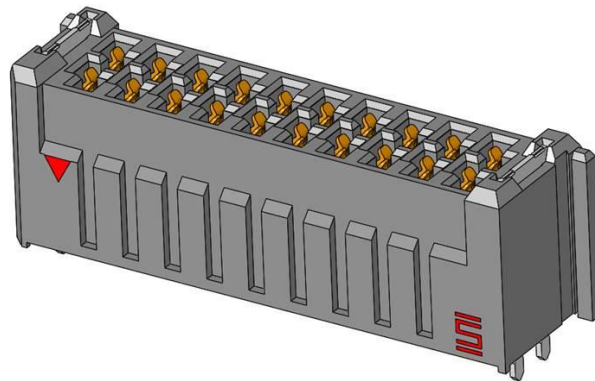
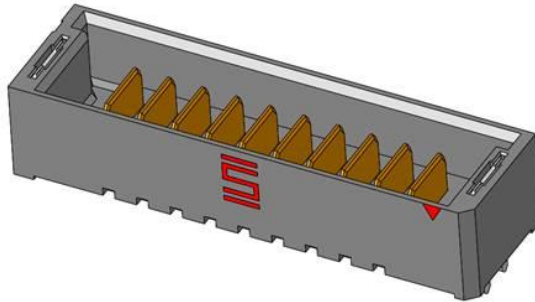




Project Number: Design Qualification Test Report	Tracking Code: 2501772_Report_Rev_3
Requested by: Roy Luo	Date: 6/2/2021
Part #: UMPS-10-XX.X-G-V-S-W-XR / UMPT-10-XX.X-G-V-S-W-XR	
Part description: UMPS/UMPT	Tech: Kason He and Peter Chen
Test Start: 7/21/2020	Test Completed: 8/11/2020



DESIGN QUALIFICATION TEST REPORT

UMPS/UMPT

UMPS-10-XX.X-G-V-S-W-XR / UMPT-10-XX.X-G-V-S-W-XR

Tracking Code:2501772_Report_Rev_3	Part #: UMPS-10-XX.X-G-V-S-W-XR / UMPT-10-XX.X-G-V-S-W-XR
Part description: UMPS/UMPT	

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
9/25/2020	1	Initial Issue	KH
12/8/2020	2	Updated the CCC data	KH
5/31/2021	3	Updated the part number	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.

All contents contained herein are the property of Samtec. No portion of this report, in part or in full shall be reproduced without prior written approval of Samtec.

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 were cleaned according to TLWI-0001.
- 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-110765-TST/PCB-110766-TST

FLOWCHARTS

Mating/Unmating/Durability

Group 1

UMPS-10-05.5-G-V-S-W-XR
UMPT-10-06.5-G-V-S-W-XR
8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽¹⁾
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force ⁽¹⁾
5.	Cycles Quantity = 25 Cycles
6.	Mating/Unmating Force ⁽¹⁾
7.	Cycles Quantity = 25 Cycles
8.	Mating/Unmating Force ⁽¹⁾
9.	Cycles Quantity = 25 Cycles
10.	Mating/Unmating Force ⁽¹⁾

Group 2

UMPS-07-05.5-G-V-S-W-XR
UMPT-07-06.5-G-V-S-W-XR
8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽¹⁾
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force ⁽¹⁾
5.	Cycles Quantity = 25 Cycles
6.	Mating/Unmating Force ⁽¹⁾
7.	Cycles Quantity = 25 Cycles
8.	Mating/Unmating Force ⁽¹⁾
9.	Cycles Quantity = 25 Cycles
10.	Mating/Unmating Force ⁽¹⁾

Group 3

UMPS-10-05.5-T-V-S-W-XR
UMPT-10-06.5-T-V-S-W-XR
8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽¹⁾
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force ⁽¹⁾
5.	Cycles Quantity = 25 Cycles
6.	Mating/Unmating Force ⁽¹⁾
7.	Cycles Quantity = 25 Cycles
8.	Mating/Unmating Force ⁽¹⁾
9.	Cycles Quantity = 25 Cycles
10.	Mating/Unmating Force ⁽¹⁾

Group 4

UMPS-07-05.5-T-V-S-W-XR
UMPT-07-06.5-T-V-S-W-XR
8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽¹⁾
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force ⁽¹⁾
5.	Cycles Quantity = 25 Cycles
6.	Mating/Unmating Force ⁽¹⁾
7.	Cycles Quantity = 25 Cycles
8.	Mating/Unmating Force ⁽¹⁾
9.	Cycles Quantity = 25 Cycles
10.	Mating/Unmating Force ⁽¹⁾

(1) Mating/Unmating Force = EIA-364-13

FLOWCHARTS Continued**Current Carrying Capacity**Group 1

UMPS-10-05.5-G-V-S-W-XR
UMPT-10-06.5-G-V-S-W-XR
1 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 1

Group 2

UMPS-10-05.5-G-V-S-W-XR
UMPT-10-06.5-G-V-S-W-XR
2 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 2

Group 3

UMPS-10-05.5-G-V-S-W-XR
UMPT-10-06.5-G-V-S-W-XR
3 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 3

Group 4

UMPS-10-05.5-G-V-S-W-XR
UMPT-10-06.5-G-V-S-W-XR
4 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 4

Group 5

UMPS-10-05.5-G-V-S-W-XR
UMPT-10-06.5-G-V-S-W-XR
10 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 10

Group 6

UMPS-10-03.5-G-V-S-W-XR
UMPT-10-01.5-G-V-S-W-XR
1 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 1

Group 7

UMPS-10-03.5-G-V-S-W-XR
UMPT-10-01.5-G-V-S-W-XR
2 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 2

Group 8

UMPS-10-03.5-G-V-S-W-XR
UMPT-10-01.5-G-V-S-W-XR
3 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 3

Group 9

UMPS-10-03.5-G-V-S-W-XR
UMPT-10-01.5-G-V-S-W-XR
4 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 4

Group 10

UMPS-10-03.5-G-V-S-W-XR
UMPT-10-01.5-G-V-S-W-XR
10 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 10

Group 11

UMPS-10-05.5-T-V-S-W-XR
UMPT-10-06.5-T-V-S-W-XR
1 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 1

Group 12

UMPS-10-05.5-T-V-S-W-XR
UMPT-10-06.5-T-V-S-W-XR
2 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 2

Group 13

UMPS-10-05.5-T-V-S-W-XR
UMPT-10-06.5-T-V-S-W-XR
3 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 3

Group 14

UMPS-10-05.5-T-V-S-W-XR
UMPT-10-06.5-T-V-S-W-XR
4 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 4

Group 15

UMPS-10-05.5-T-V-S-W-XR
UMPT-10-06.5-T-V-S-W-XR
10 Pins Powered
Power

Step	Description
1.	CCC ⁽¹⁾ Rows ■ 1 Number of Positions ■ 10

(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.

MATING/UNMATING:

- 1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
- 2) The full insertion position was to within 0.003” to 0.004” of the plug bottoming out in the receptacle to prevent damage to the system under test.
- 3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

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. 85° C
 - c. 95° C
 - d. 115° C
- 8) Typically, neighboring contacts (in close proximity to maximize heat buildup) 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.

RESULTS

Temperature Rise, CCC at a 20% de-rating

UMPS-10-05.5-G-V-S-W-XR /UMPT-10-06.5-G-V-S-W-XR

- CCC for a 30°C Temperature Rise-----16.3 A per contact with 1 contact (1x1) powered
- CCC for a 30°C Temperature Rise-----14.5 A per contact with 2 contacts (1x2) powered
- CCC for a 30°C Temperature Rise-----12.5 A per contact with 3 contacts (1x3) powered
- CCC for a 30°C Temperature Rise-----12.1 A per contact with 4 contacts (1x4) powered
- CCC for a 30°C Temperature Rise-----8.9 A per contact with 10 contacts (1x10) powered

UMPS-10-03.5-G-V-S-W-XR/UMPT-10-01.5-G-V-S-W-XR

- CCC for a 30°C Temperature Rise-----16.2 A per contact with 1 contact (1x1) powered
- CCC for a 30°C Temperature Rise-----14.6 A per contact with 2 contacts (1x2) powered
- CCC for a 30°C Temperature Rise-----12.6 A per contact with 3 contacts (1x3) powered
- CCC for a 30°C Temperature Rise-----12.5 A per contact with 4 contacts (1x4) powered
- CCC for a 30°C Temperature Rise-----9.4 A per contact with 10 contacts (1x10) powered

UMPS-10-05.5-T-V-S-W-XR/UMPT-10-06.5-T-V-S-W-XR

- CCC for a 30°C Temperature Rise-----17.1 A per contact with 1 contact (1x1) powered
- CCC for a 30°C Temperature Rise-----15.4 A per contact with 2 contacts (1x2) powered
- CCC for a 30°C Temperature Rise-----13.5 A per contact with 3 contacts (1x3) powered
- CCC for a 30°C Temperature Rise-----12.9 A per contact with 4 contacts (1x4) powered
- CCC for a 30°C Temperature Rise-----9.8 A per contact with 10 contacts (1x10) powered

RESULTS Continued**Mating – Unmating Forces****Mating-Unmating Durability Group 1 (UMPS-10-05.5-G-V-S-W-XR/UMPT-10-06.5-G-V-S-W-XR)**

- **Initial**
 - **Mating**
 - **Min** ----- 8.36 Lbs
 - **Max** ----- 10.33 Lbs
 - **Unmating**
 - **Min** ----- 7.05 Lbs
 - **Max** ----- 7.65 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 9.37 Lbs
 - **Max** ----- 12.03 Lbs
 - **Unmating**
 - **Min** ----- 8.20 Lbs
 - **Max** ----- 10.45 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 10.67 Lbs
 - **Max** ----- 12.91 Lbs
 - **Unmating**
 - **Min** ----- 9.47 Lbs
 - **Max** ----- 10.45 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 11.15 Lbs
 - **Max** ----- 13.90 Lbs
 - **Unmating**
 - **Min** ----- 9.65 Lbs
 - **Max** ----- 10.37 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 11.39 Lbs
 - **Max** ----- 13.94 Lbs
 - **Unmating**
 - **Min** ----- 8.95 Lbs
 - **Max** ----- 10.38 Lbs

RESULTS Continued**Mating-Unmating Durability Group 2 (UMPS-07-05.5-G-V-S-W-XR/UMPT-07-06.5-G-V-S-W-XR)**

- **Initial**
 - **Mating**
 - **Min** ----- 6.81 Lbs
 - **Max** ----- 8.76 Lbs
 - **Unmating**
 - **Min** ----- 5.39 Lbs
 - **Max** ----- 6.64 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 6.78 Lbs
 - **Max** ----- 7.94 Lbs
 - **Unmating**
 - **Min** ----- 6.55 Lbs
 - **Max** ----- 7.76 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 7.46 Lbs
 - **Max** ----- 8.05 Lbs
 - **Unmating**
 - **Min** ----- 7.71 Lbs
 - **Max** ----- 8.19 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 7.32 Lbs
 - **Max** ----- 8.17 Lbs
 - **Unmating**
 - **Min** ----- 7.15 Lbs
 - **Max** ----- 8.16 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 7.19 Lbs
 - **Max** ----- 8.22 Lbs
 - **Unmating**
 - **Min** ----- 6.29 Lbs
 - **Max** ----- 7.36 Lbs

RESULTS Continued**Mating-Unmating Durability Group 3 (UMPS-10-05.5-T-V-S-W-XR/UMPT-10-06.5-T-V-S-W-XR)**

- **Initial**
 - **Mating**
 - **Min -----12.65 Lbs**
 - **Max-----15.22 Lbs**
 - **Unmating**
 - **Min ----- 8.95 Lbs**
 - **Max-----13.87 Lbs**
- **After 25 Cycles**
 - **Mating**
 - **Min -----13.31 Lbs**
 - **Max-----16.66 Lbs**
 - **Unmating**
 - **Min ----- 8.74 Lbs**
 - **Max-----10.70 Lbs**
- **After 50 Cycles**
 - **Mating**
 - **Min -----13.70 Lbs**
 - **Max-----17.10 Lbs**
 - **Unmating**
 - **Min ----- 9.39 Lbs**
 - **Max-----10.94 Lbs**
- **After 75 Cycles**
 - **Mating**
 - **Min -----13.87 Lbs**
 - **Max-----17.37 Lbs**
 - **Unmating**
 - **Min ----- 9.55 Lbs**
 - **Max-----10.70 Lbs**
- **After 100 Cycles**
 - **Mating**
 - **Min -----13.94 Lbs**
 - **Max-----16.58 Lbs**
 - **Unmating**
 - **Min ----- 9.58 Lbs**
 - **Max-----11.10 Lbs**

RESULTS Continued**Mating-Unmating Durability Group 4 (UMPS-07-05.5-T-V-S-W-XR/UMPT-07-06.5-T-V-S-W-XR)**

- **Initial**
 - **Mating**
 - **Min** ----- 8.35 Lbs
 - **Max** ----- 9.31 Lbs
 - **Unmating**
 - **Min** ----- 5.71 Lbs
 - **Max** ----- 9.58 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 9.21 Lbs
 - **Max** ----- 10.98 Lbs
 - **Unmating**
 - **Min** ----- 6.22 Lbs
 - **Max** ----- 8.35 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 9.53 Lbs
 - **Max** ----- 11.35 Lbs
 - **Unmating**
 - **Min** ----- 6.85 Lbs
 - **Max** ----- 8.41 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 9.50 Lbs
 - **Max** ----- 11.15 Lbs
 - **Unmating**
 - **Min** ----- 7.03 Lbs
 - **Max** ----- 8.64 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 9.66 Lbs
 - **Max** ----- 11.21 Lbs
 - **Unmating**
 - **Min** ----- 6.65 Lbs
 - **Max** ----- 8.89 Lbs

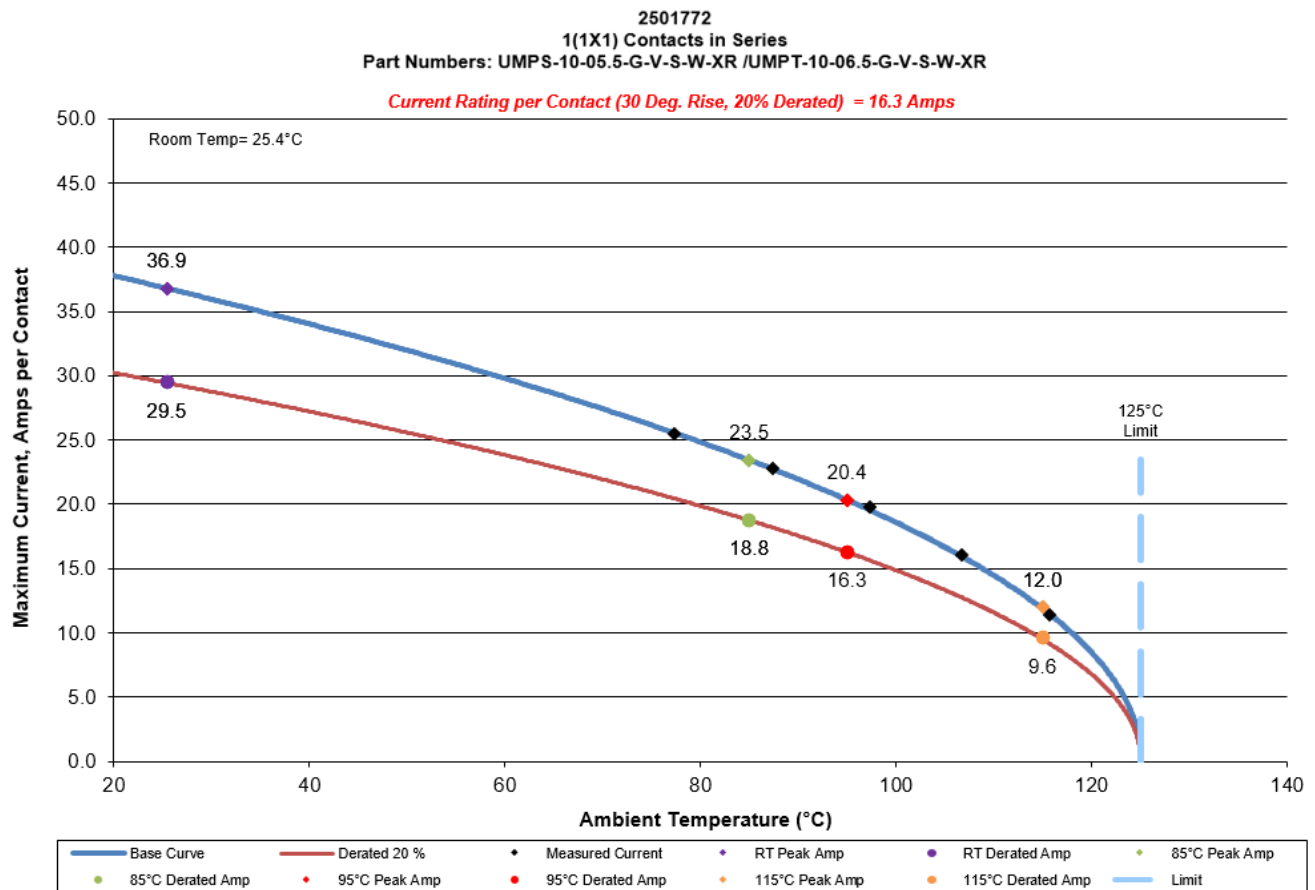
DATA SUMMARIES

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:

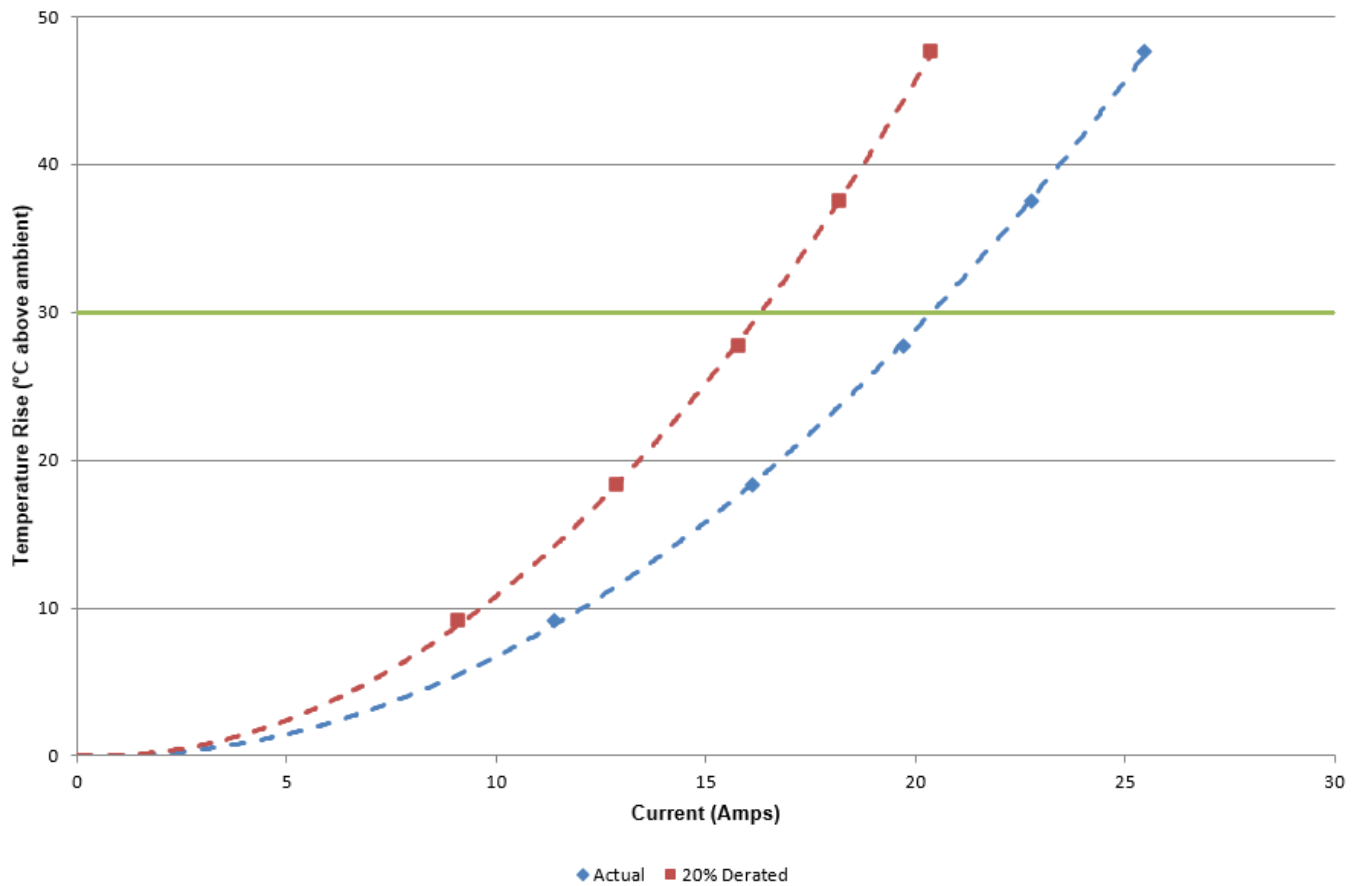
UMPS-10-05.5-G-V-S-W-XR /UMPT-10-06.5-G-V-S-W-XR

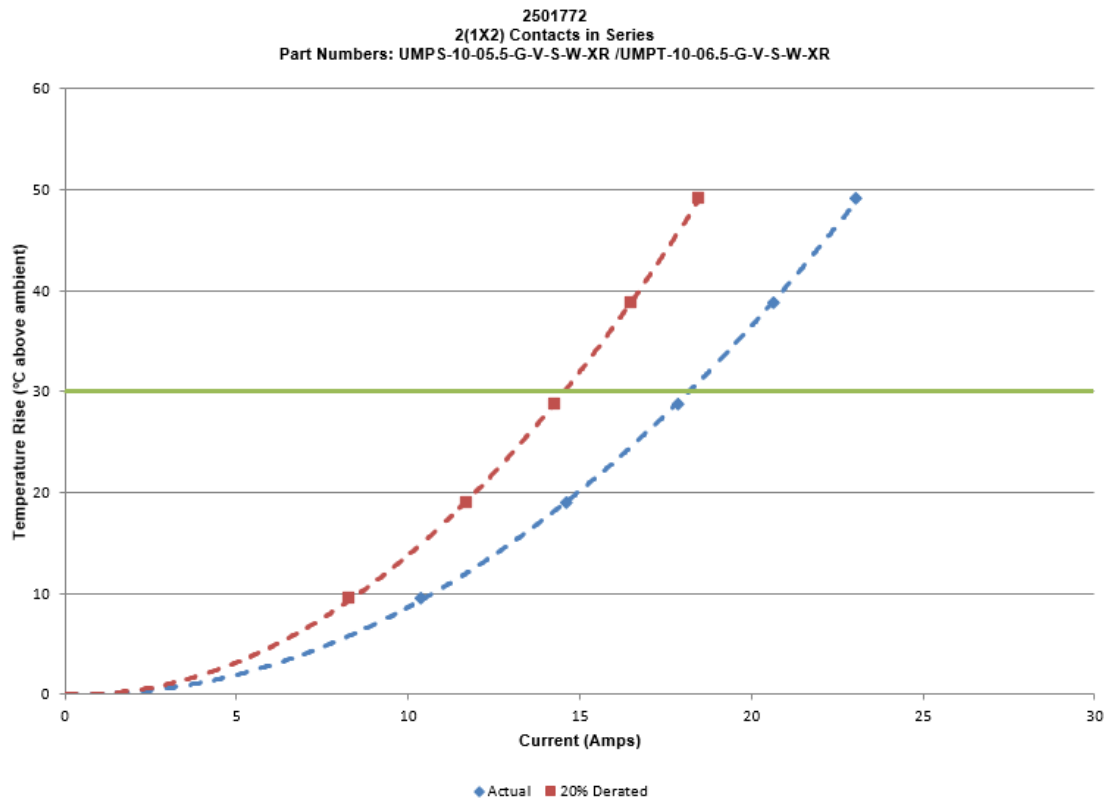
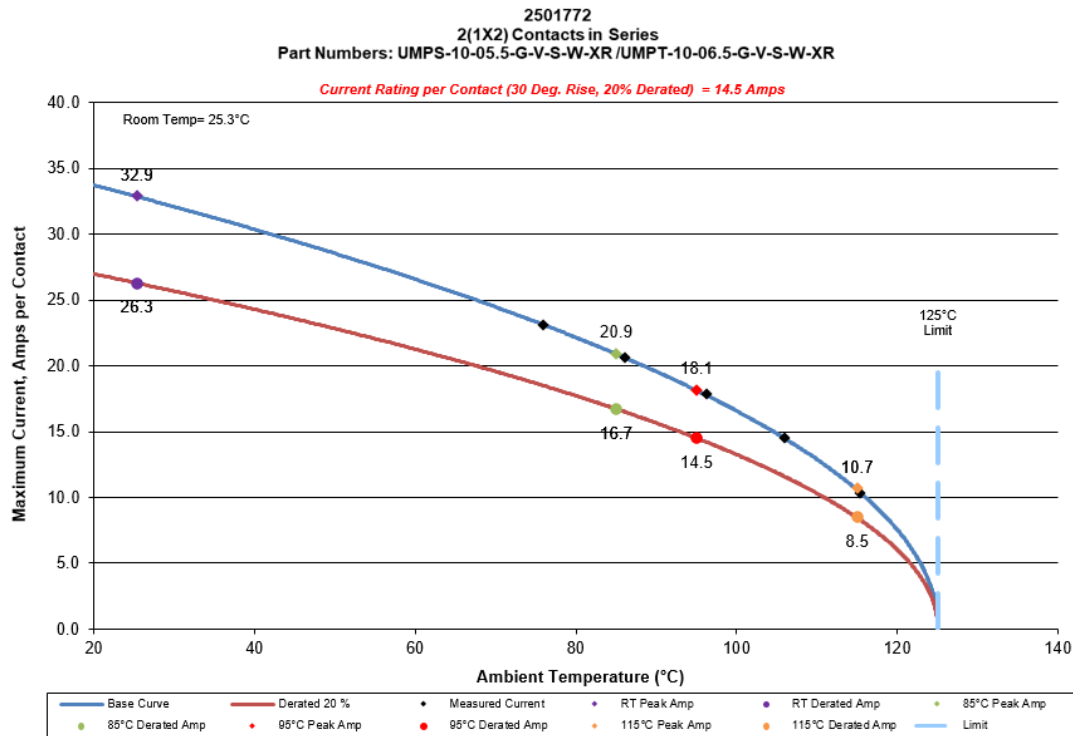
- a. Linear configuration with 1 adjacent conductors/contacts powered



DATA SUMMARIES Continued

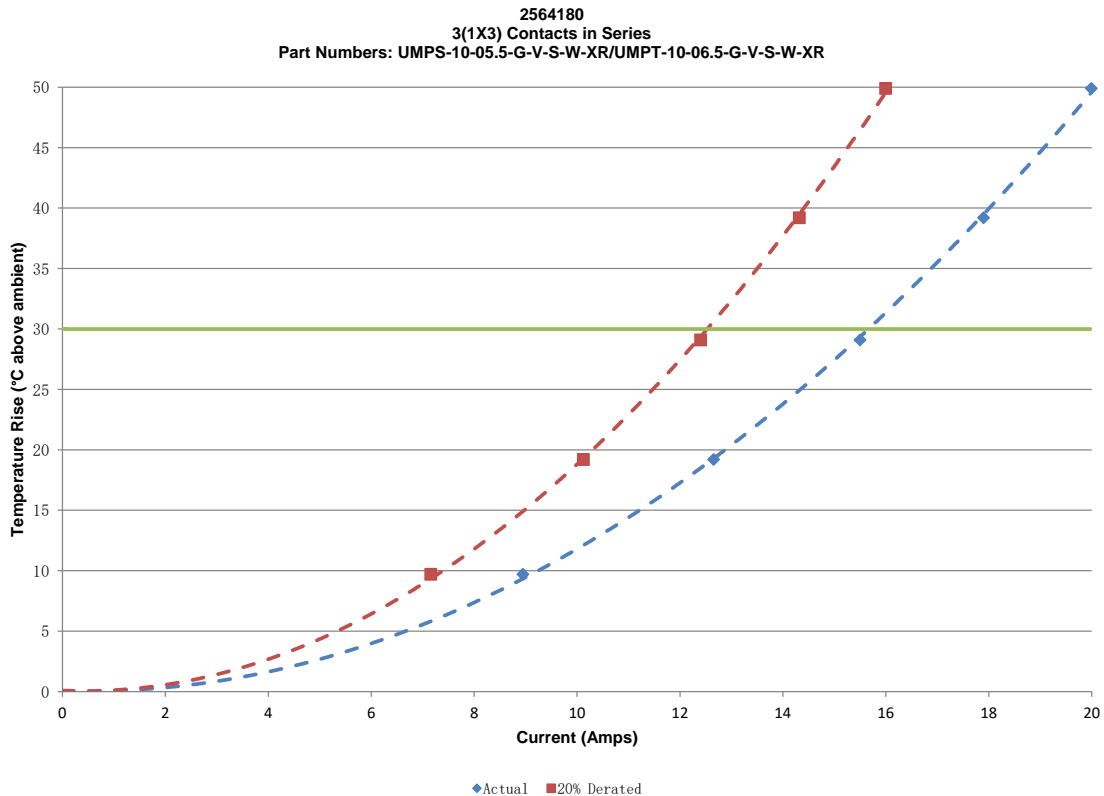
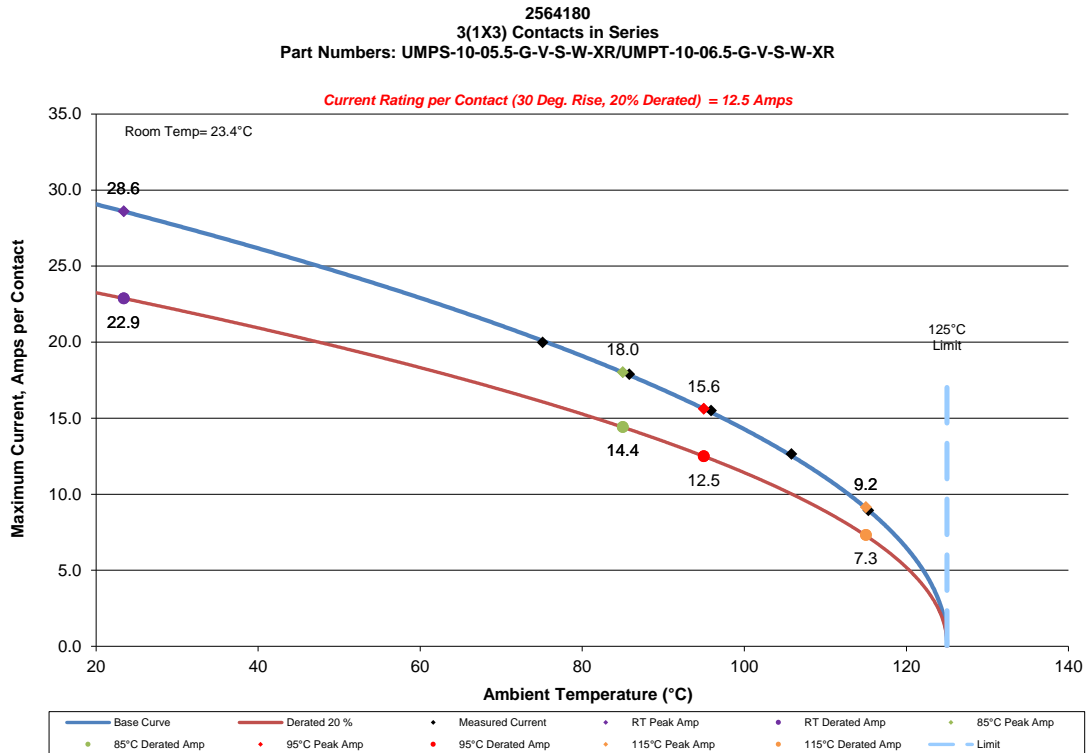
2501772
1(1X1) Contacts in Series
Part Numbers: UMPS-10-05.5-G-V-S-W-XR / UMPT-10-06.5-G-V-S-W-XR

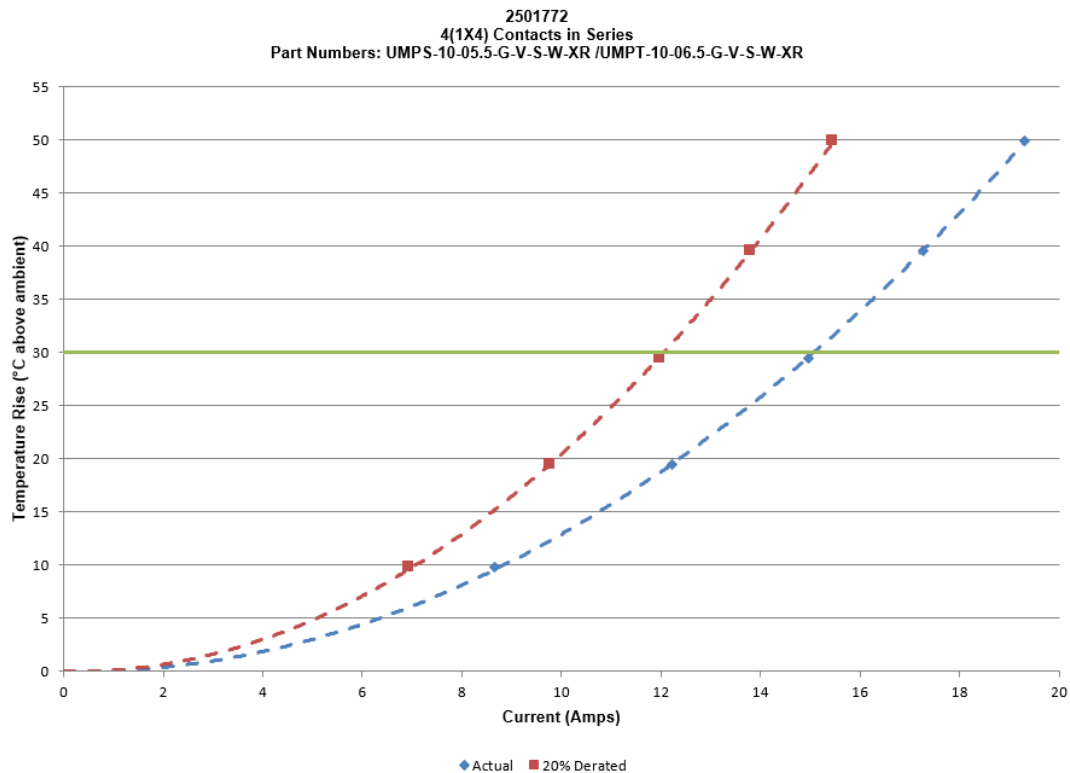
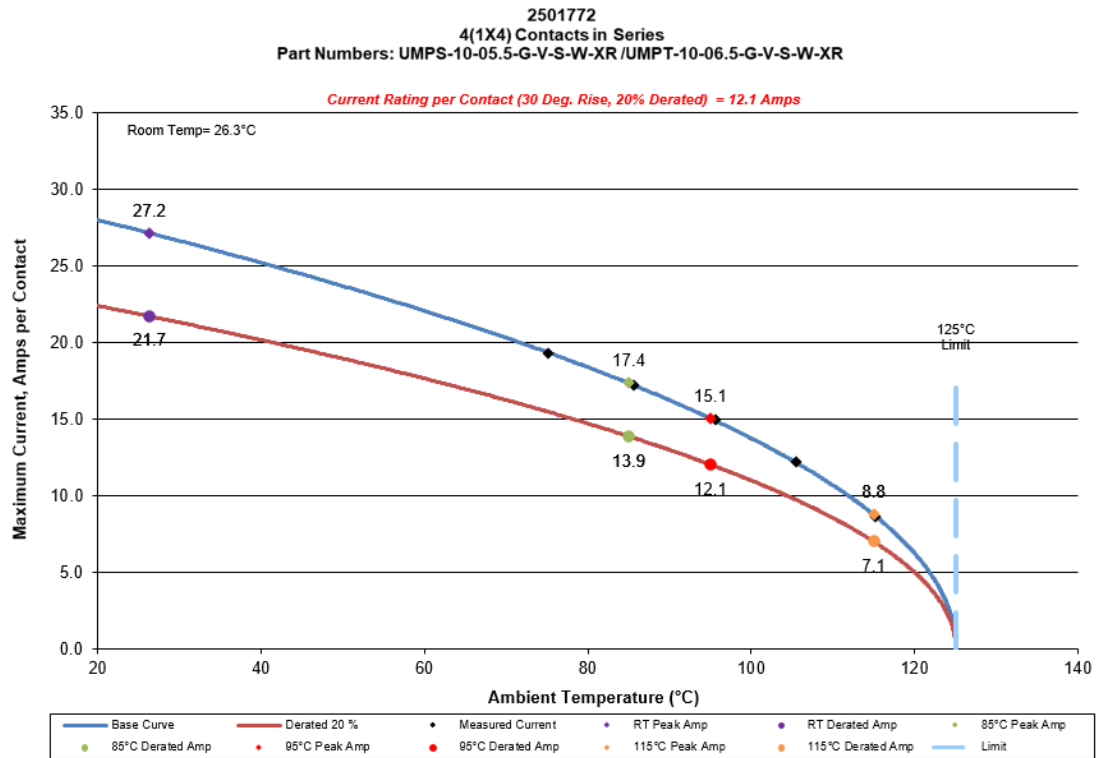


DATA SUMMARIES Continued**b. Linear configuration with 2 adjacent conductors/contacts powered**

DATA SUMMARIES Continued

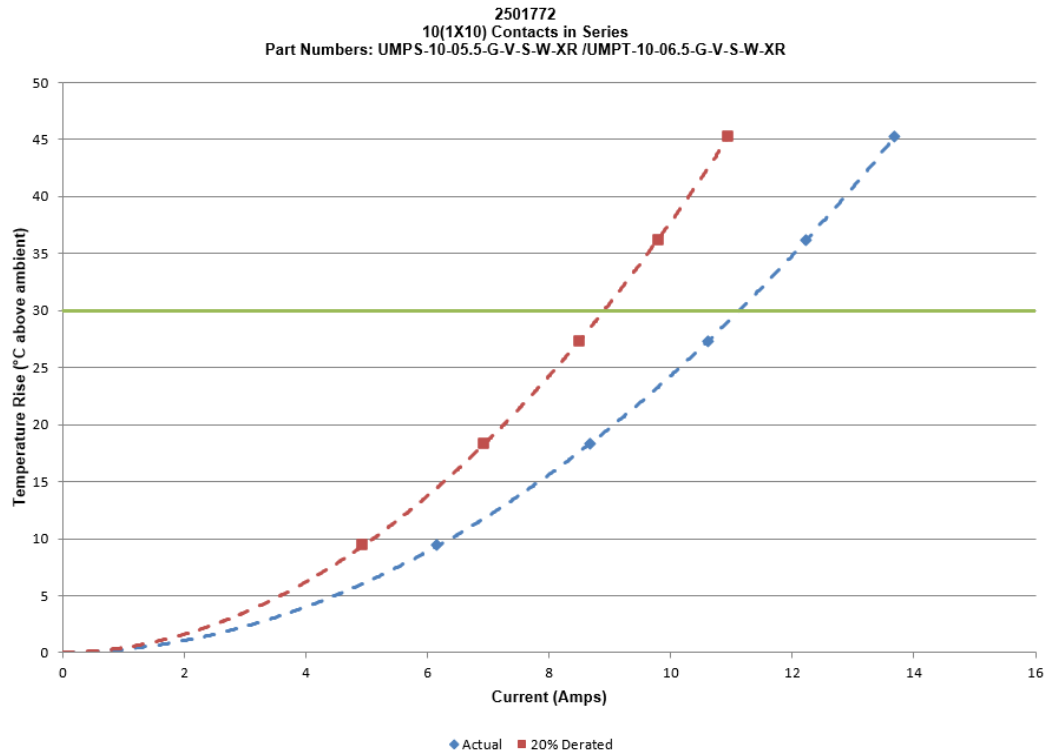
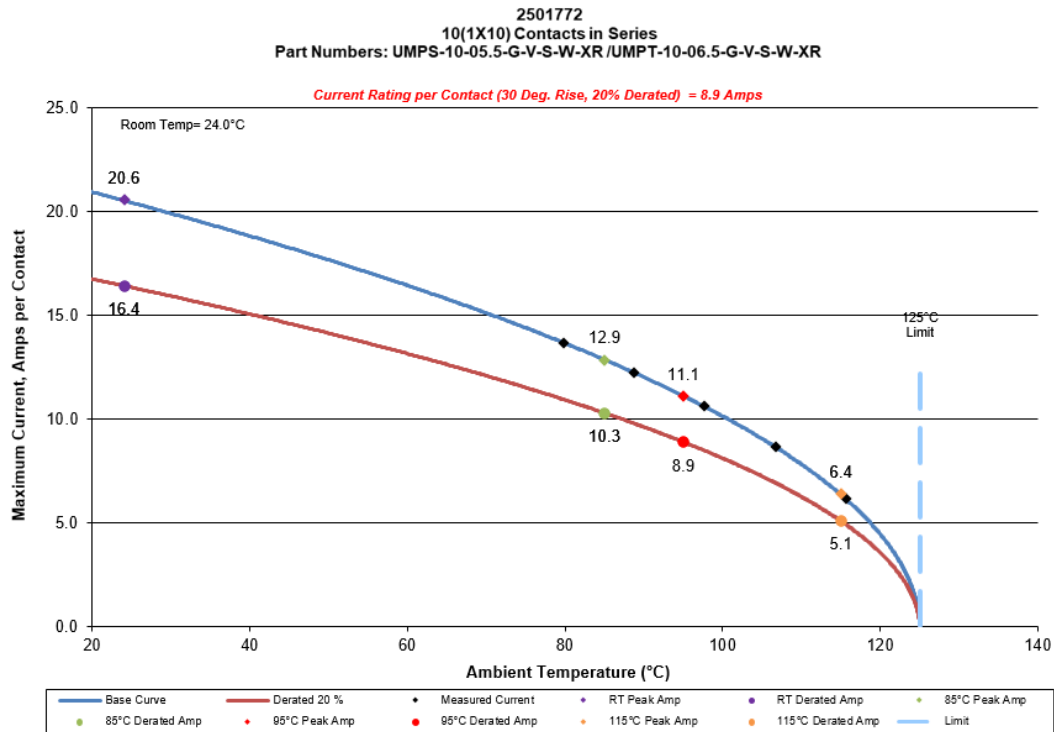
c. Linear configuration with 3 adjacent conductors/contacts powered



DATA SUMMARIES Continued**d. Linear configuration with 4 adjacent conductors/contacts powered**

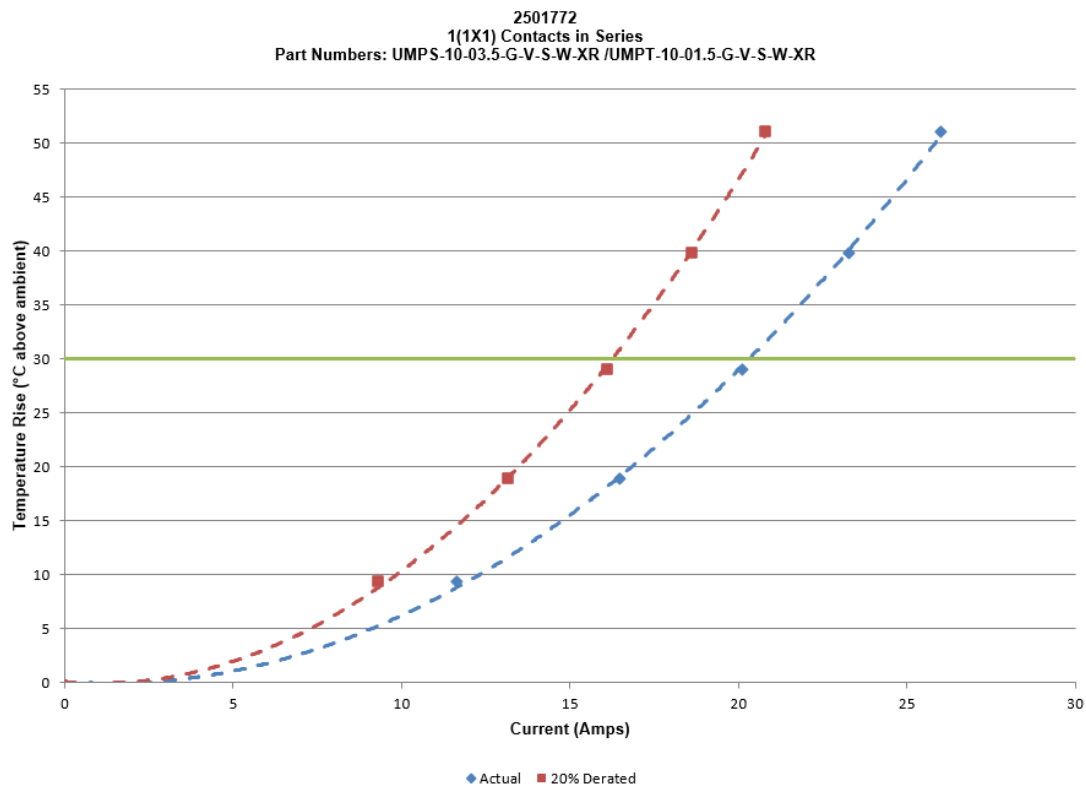
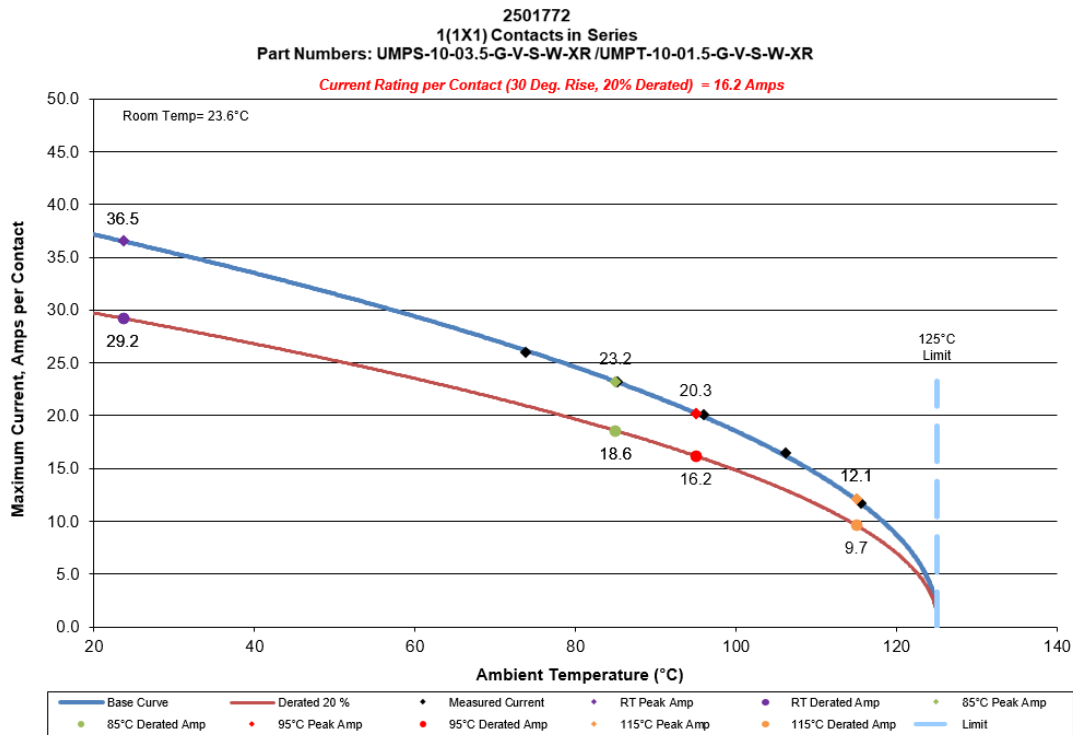
DATA SUMMARIES Continued

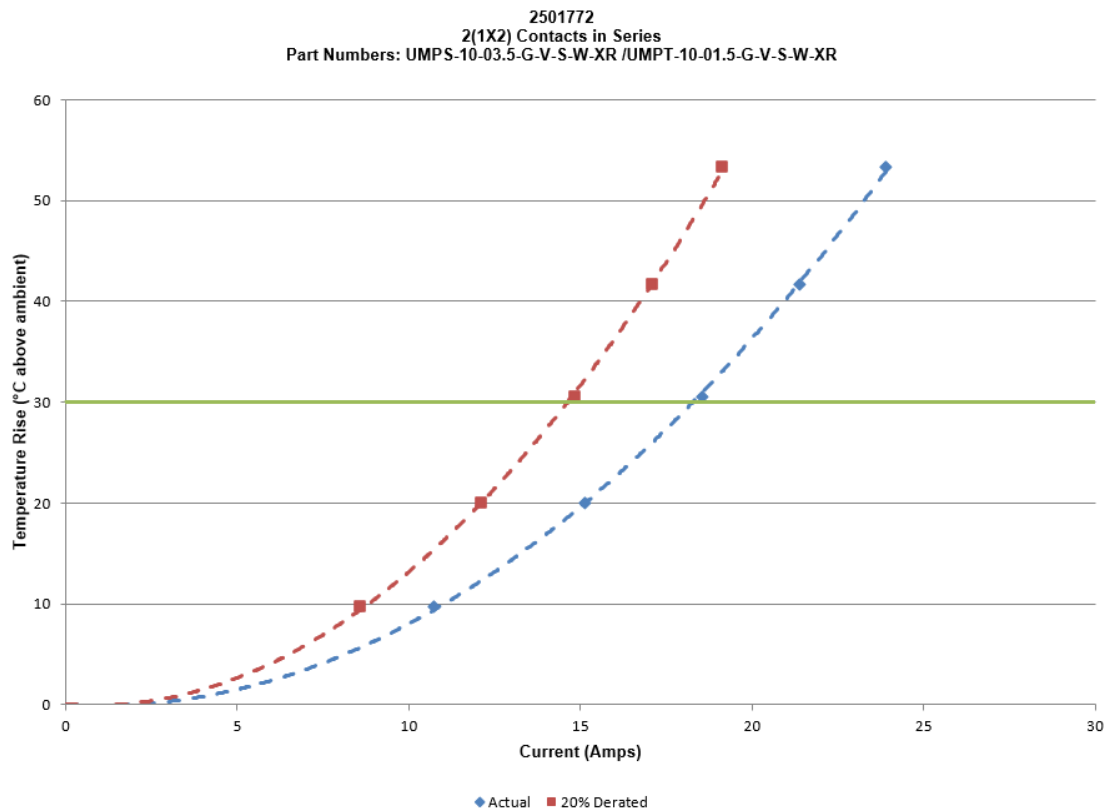
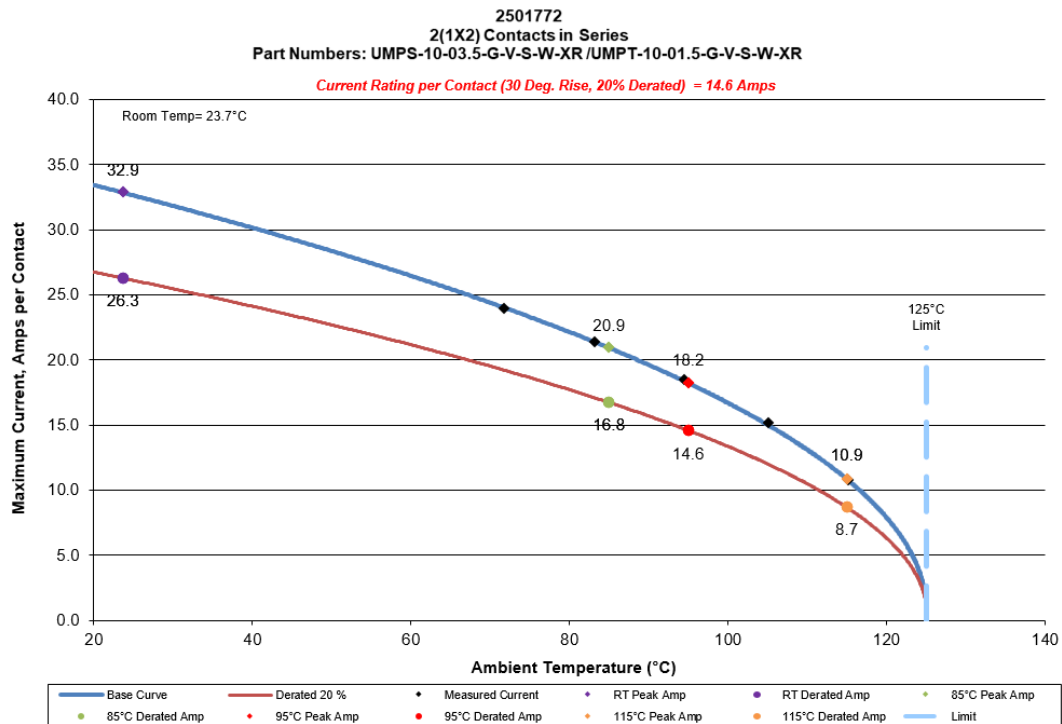
e. Linear configuration with all adjacent conductors/contacts powered



DATA SUMMARIES Continued**UMPS-10-03.5-G-V-S-W-XR/UMPT-10-01.5-G-V-S-W-XR**

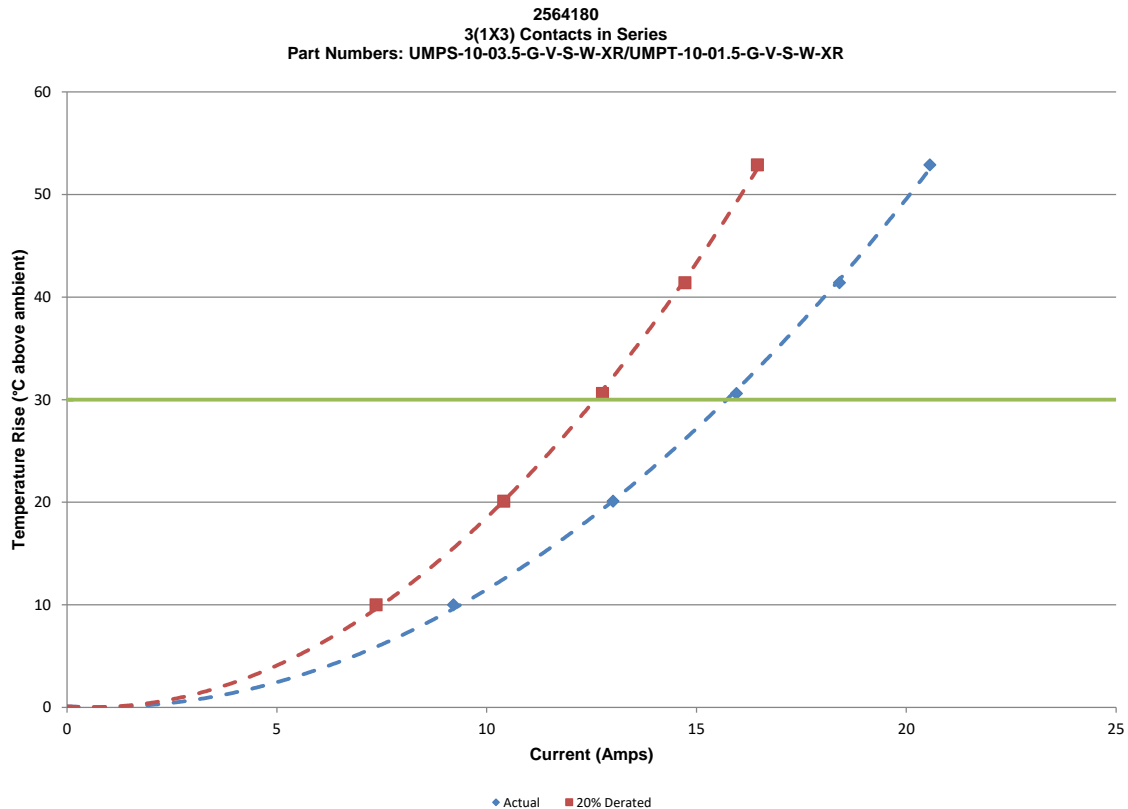
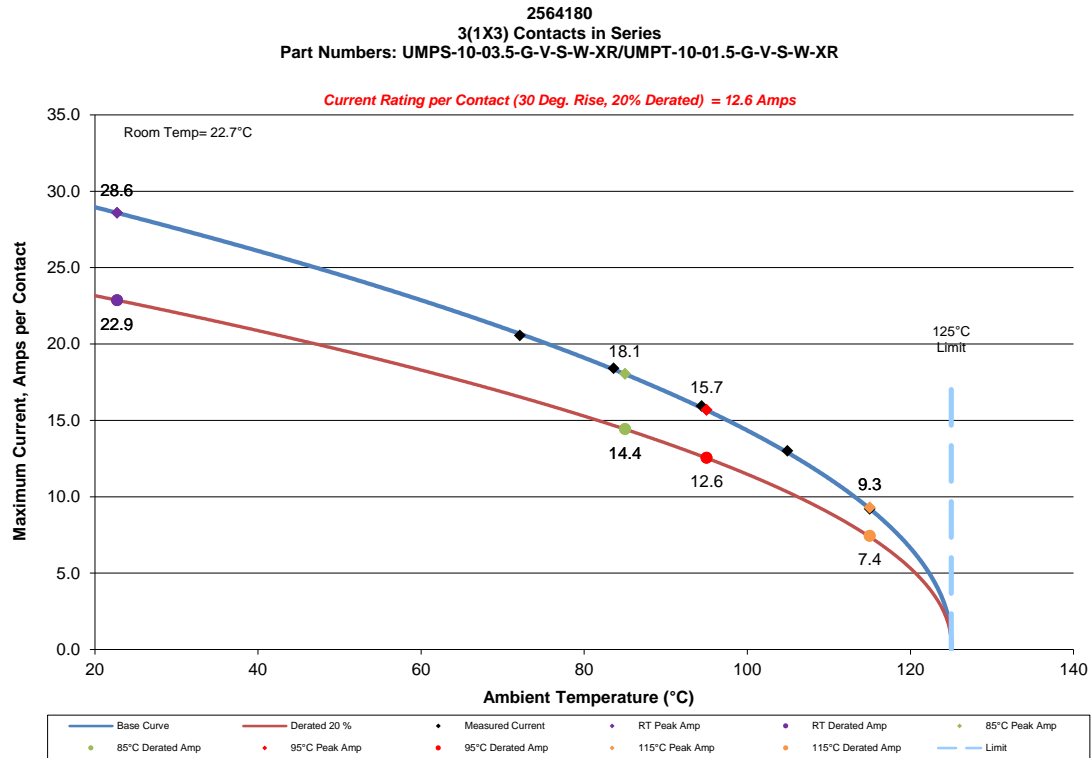
a. Linear configuration with 1 adjacent conductors/contacts powered



DATA SUMMARIES Continued**b. Linear configuration with 2 adjacent conductors/contacts powered**

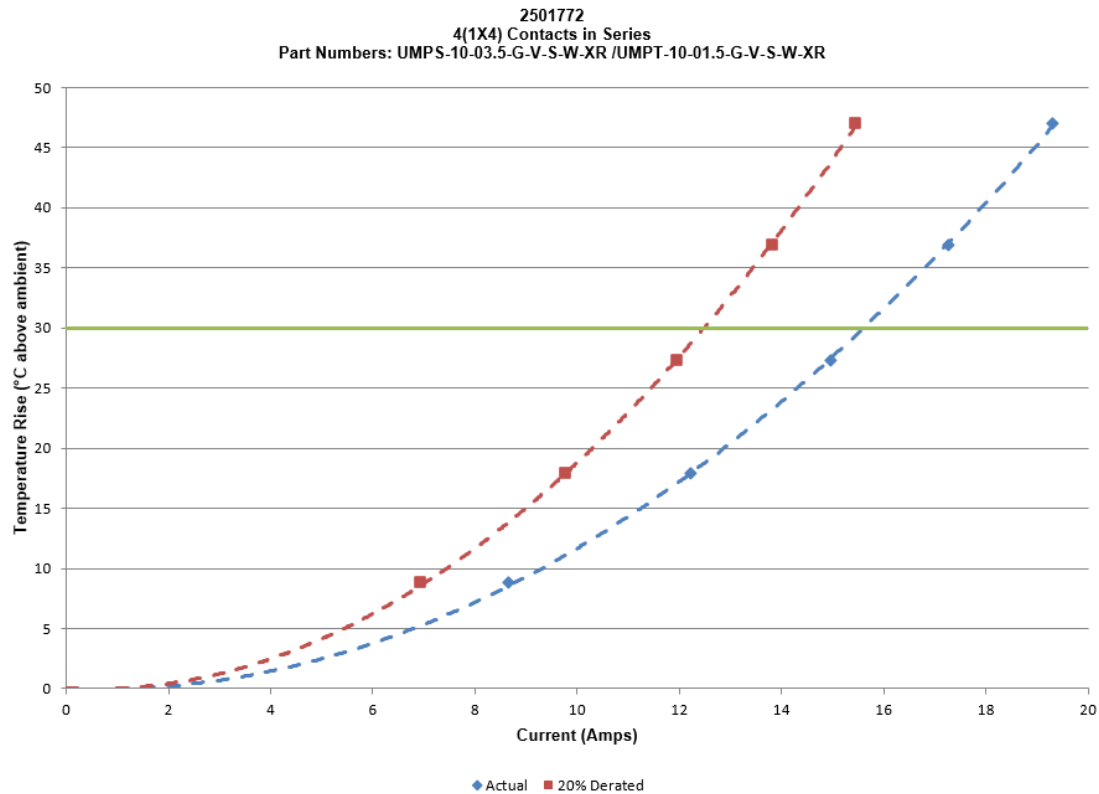
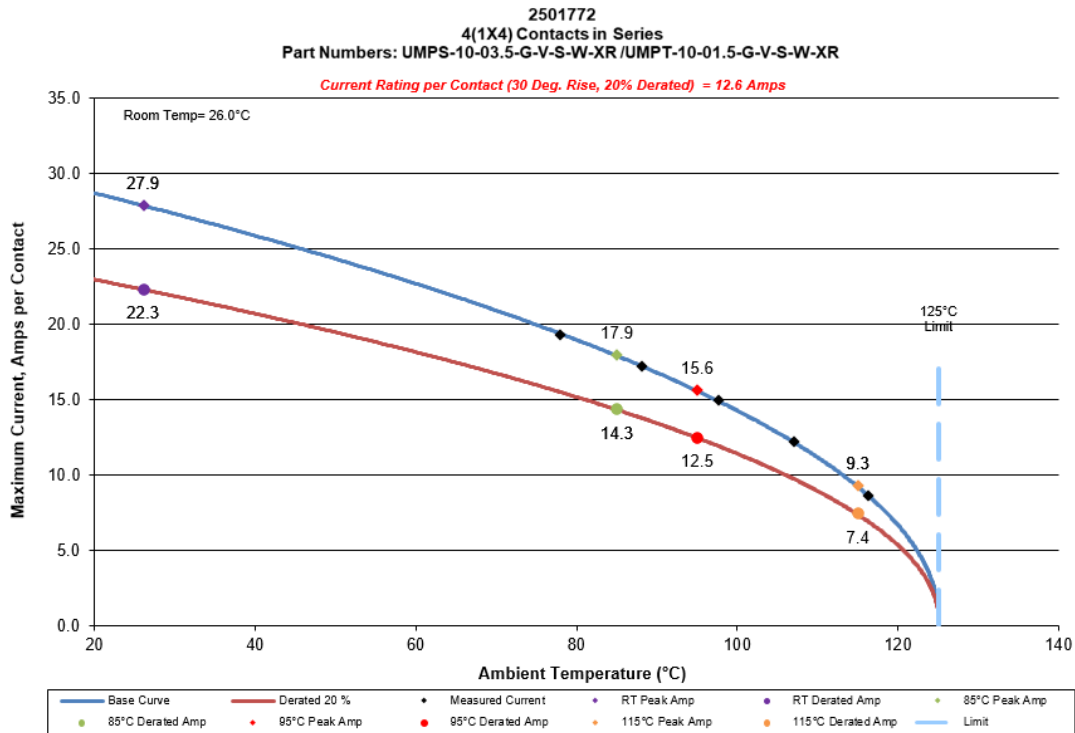
DATA SUMMARIES Continued

c. Linear configuration with 3 adjacent conductors/contacts powered



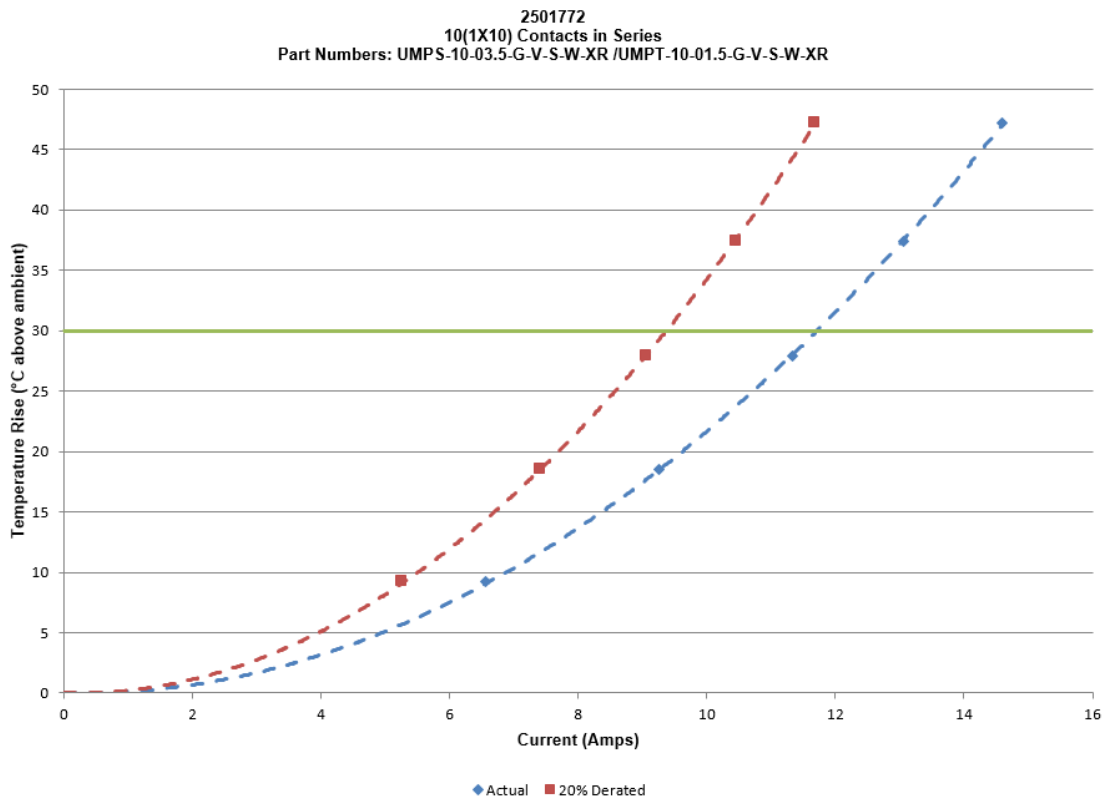
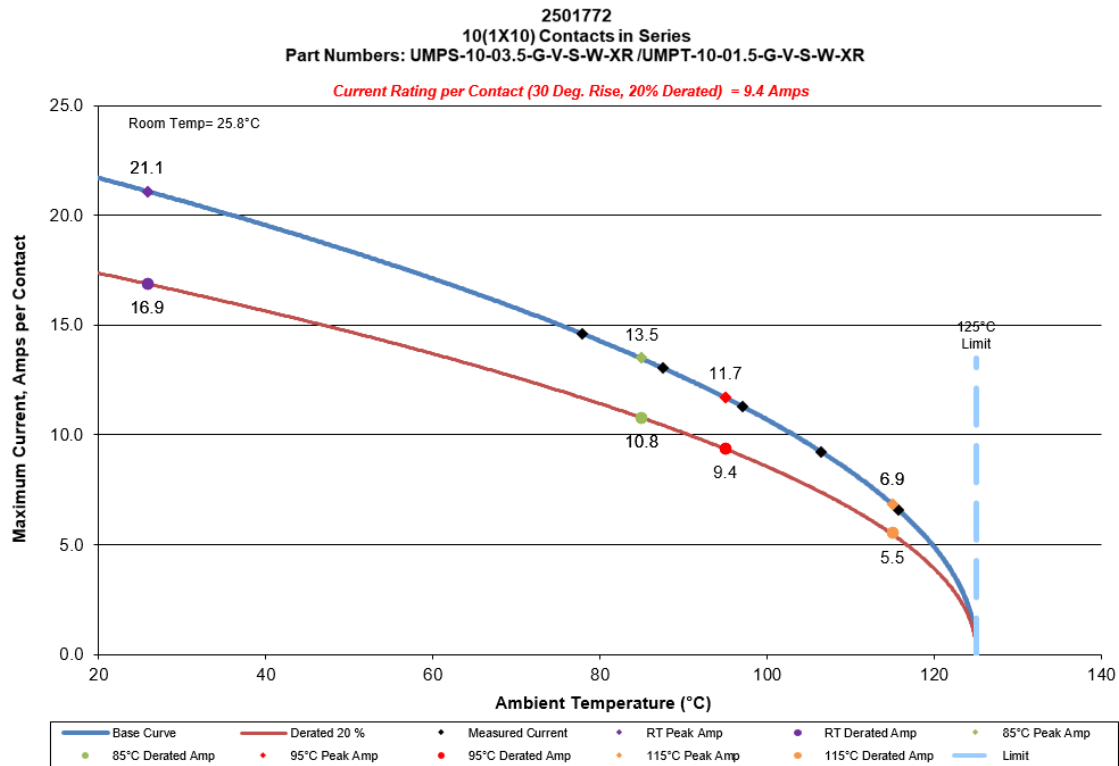
DATA SUMMARIES Continued

d. Linear configuration with 4 adjacent conductors/contacts powered



DATA SUMMARIES Continued

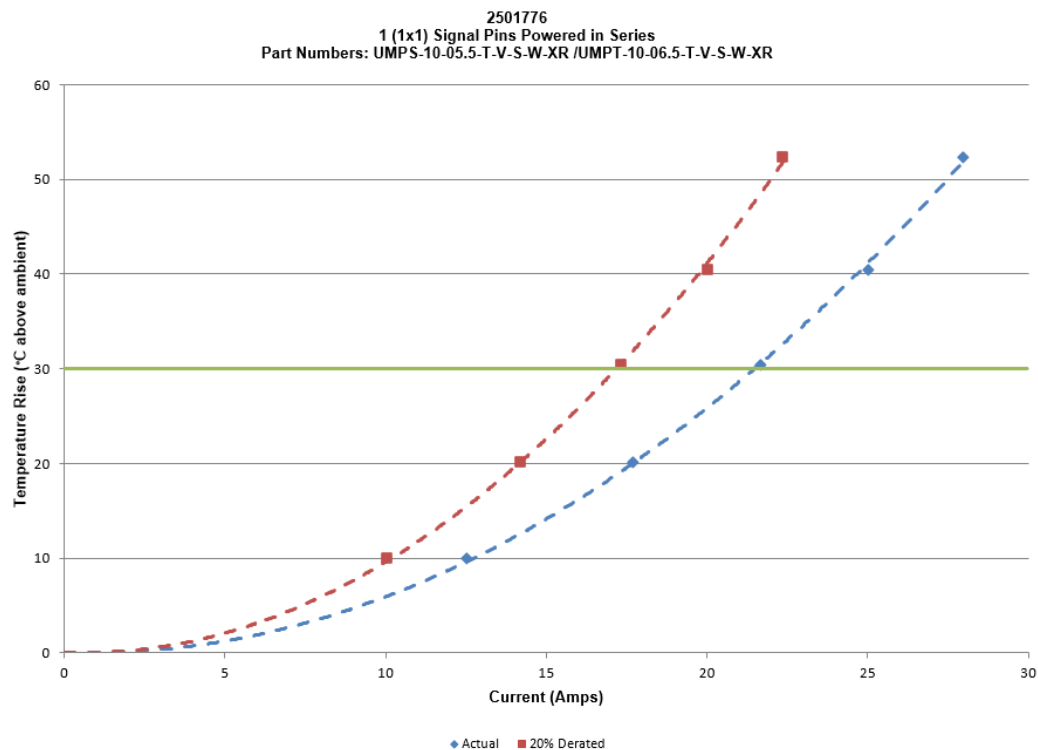
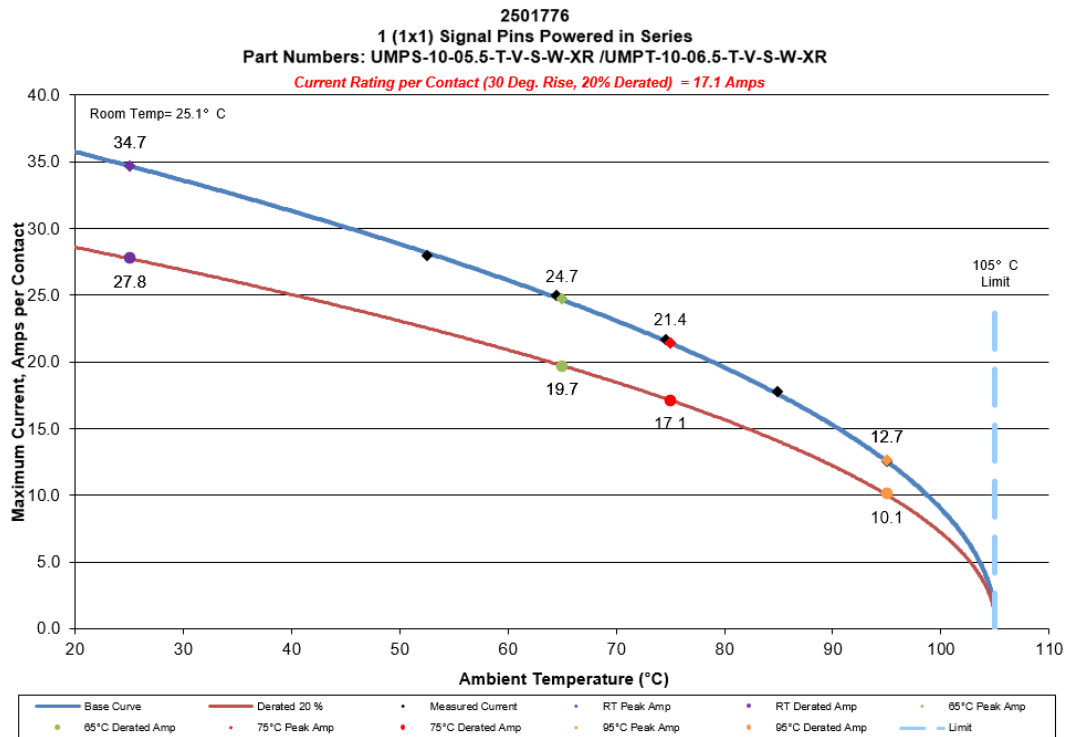
e. Linear configuration with all adjacent conductors/contacts powered

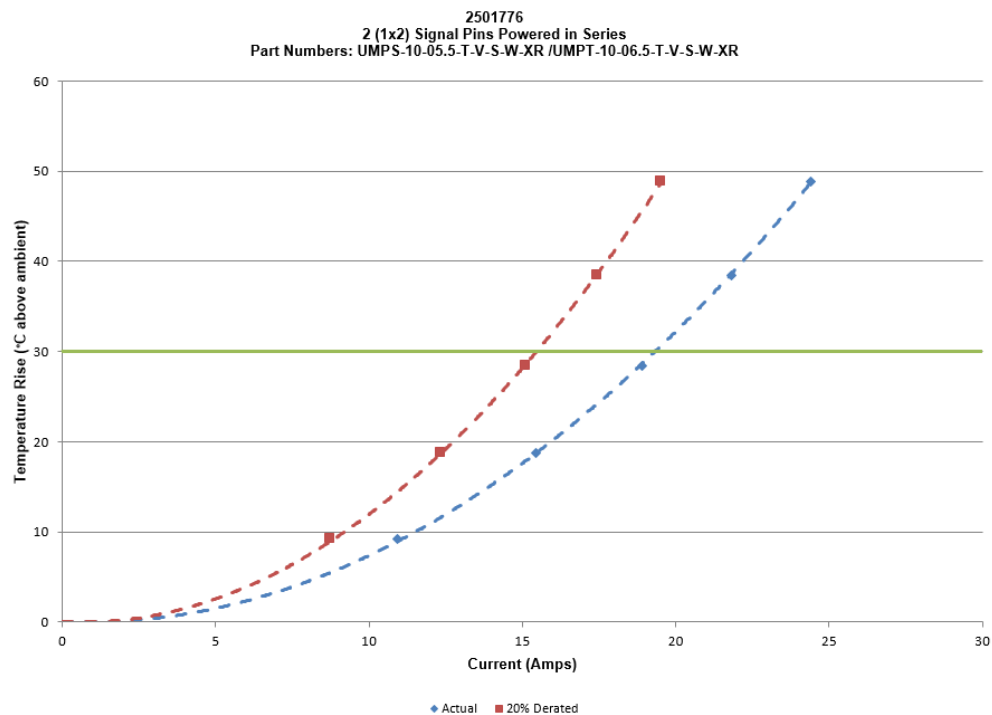
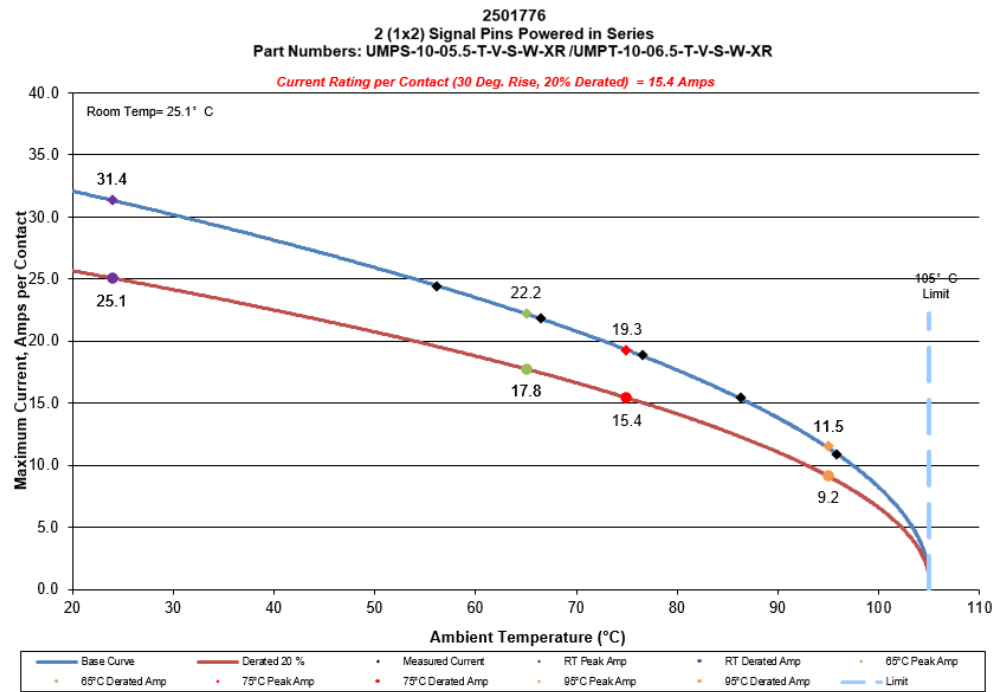


DATA SUMMARIES Continued

UMPS-10-05.5-T-V-S-W-XR/UMPT-10-06.5-T-V-S-W-XR

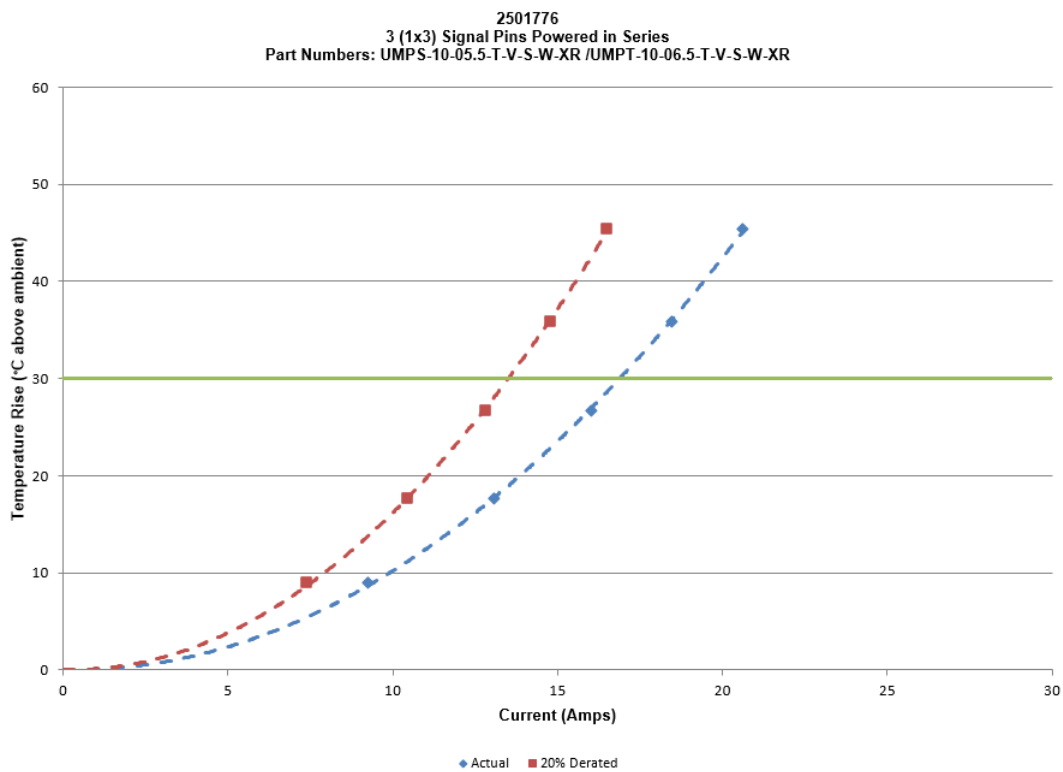
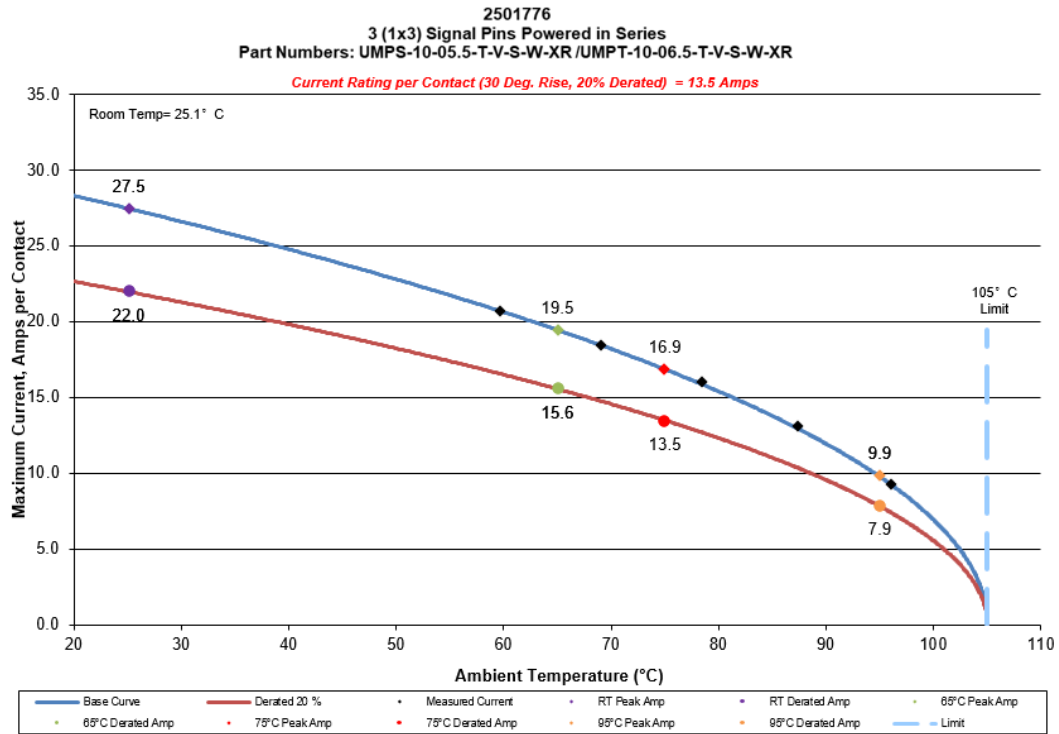
a. Linear configuration with 1 adjacent conductors/contacts powered

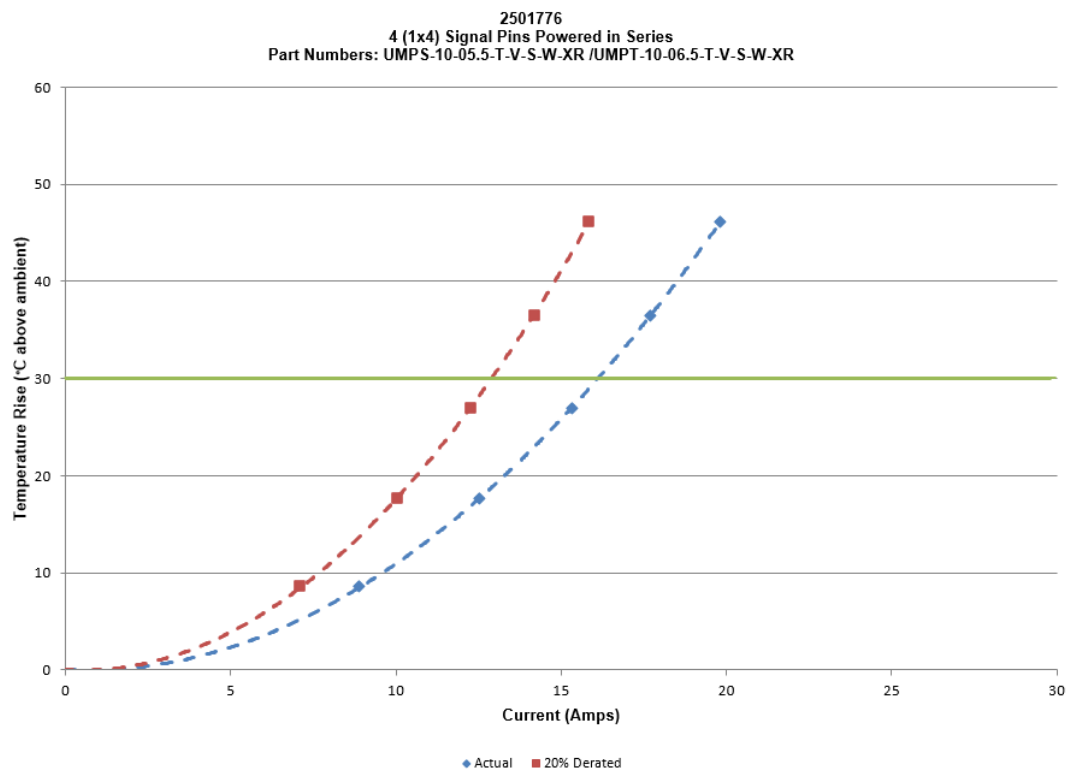
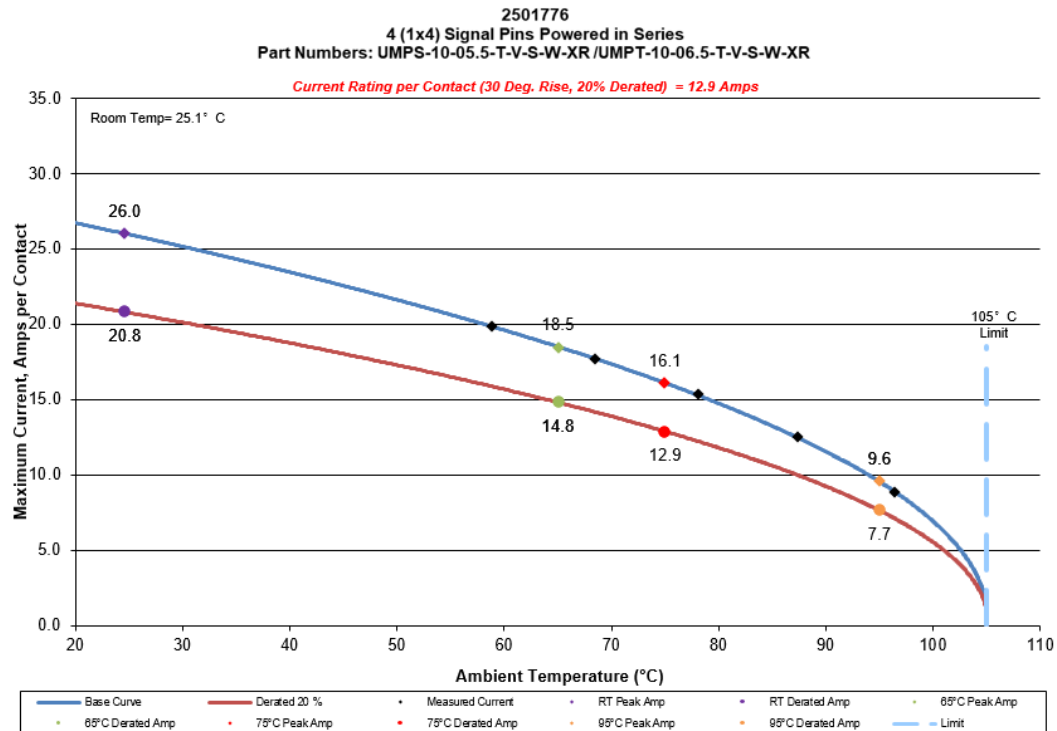


DATA SUMMARIES Continued**b. Linear configuration with 2 adjacent conductors/contacts powered**

DATA SUMMARIES Continued

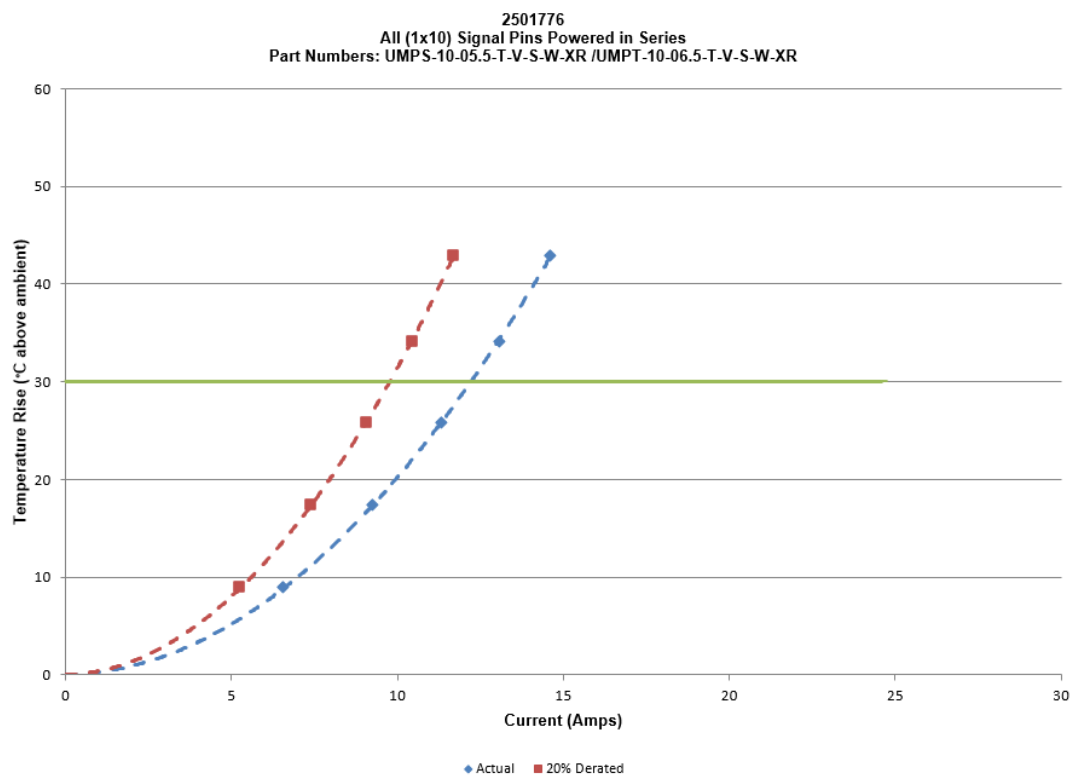
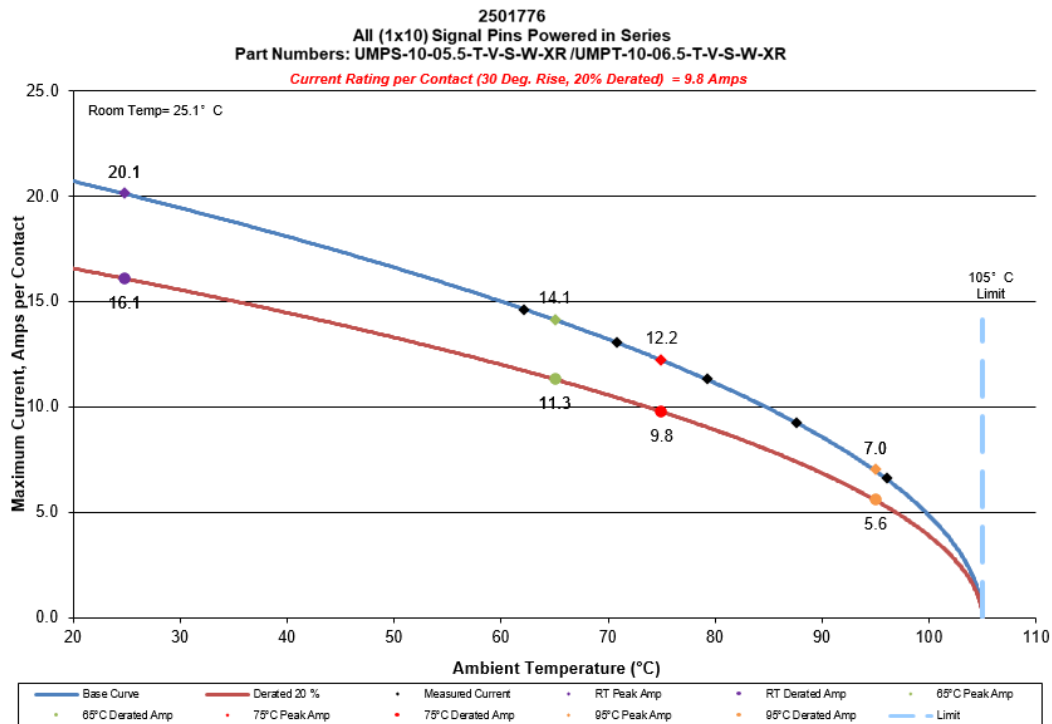
c. Linear configuration with 3 adjacent conductors/contacts powered



DATA SUMMARIES Continued**d. Linear configuration with 4 adjacent conductors/contacts powered**

DATA SUMMARIES Continued

e. Linear configuration with all adjacent conductors/contacts powered



DATA SUMMARIES Continued**MATING-UNMATING FORCE:****Mating-Unmating Durability Group 1 (UMPS-10-05.5-G-V-S-W-XR/UMPT-10-06.5-G-V-S-W-XR)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	37.19	8.36	31.36	7.05	41.68	9.37	36.47	8.20
Maximum	45.95	10.33	34.03	7.65	53.51	12.03	46.48	10.45
Average	42.51	9.56	32.90	7.40	50.68	11.40	43.84	9.86
St Dev	2.68	0.60	0.83	0.19	4.41	0.99	3.18	0.71
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	47.46	10.67	42.12	9.47	49.60	11.15	42.92	9.65
Maximum	57.42	12.91	46.48	10.45	61.83	13.90	46.13	10.37
Average	52.58	11.82	44.72	10.05	56.52	12.71	44.56	10.02
St Dev	3.32	0.75	1.65	0.37	3.87	0.87	1.07	0.24
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	Newtons	Force (Lbs)	Newtons	Force (Lbs)				
Minimum	50.66	11.39	39.81	8.95				
Maximum	62.01	13.94	46.17	10.38				
Average	58.59	13.17	43.90	9.87				
St Dev	3.80	0.85	2.29	0.52				
Count	8	8	8	8				

DATA SUMMARIES Continued**Mating-Unmating Durability Group 2 (UMPS-07-05.5-G-V-S-W-XR/UMPT-07-06.5-G-V-S-W-XR)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	30.29	6.81	23.97	5.39	30.16	6.78	29.13	6.55
Maximum	38.96	8.76	29.53	6.64	35.32	7.94	34.52	7.76
Average	34.88	7.84	27.31	6.14	33.68	7.57	32.13	7.22
St Dev	2.95	0.66	2.14	0.48	2.17	0.49	1.71	0.39
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	33.18	7.46	34.29	7.71	32.56	7.32	31.80	7.15
Maximum	35.81	8.05	36.43	8.19	36.34	8.17	36.30	8.16
Average	35.13	7.90	35.47	7.97	35.08	7.89	34.19	7.69
St Dev	0.94	0.21	0.91	0.20	1.17	0.26	1.70	0.38
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	Newtons	Force (Lbs)	Newtons	Force (Lbs)				
Minimum	31.98	7.19	27.98	6.29				
Maximum	36.56	8.22	32.74	7.36				
Average	34.59	7.78	30.64	6.89				
St Dev	1.65	0.37	1.40	0.32				
Count	8	8	8	8				

DATA SUMMARIES Continued**Mating-Unmating Durability Group 3 (UMPS-10-05.5-T-V-S-W-XR/UMPT-10-06.5-T-V-S-W-XR)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	56.27	12.65	39.81	8.95	59.20	13.31	38.88	8.74
Maximum	67.70	15.22	61.69	13.87	74.10	16.66	47.59	10.70
Average	59.68	13.42	52.86	11.88	64.12	14.42	43.36	9.75
St Dev	4.04	0.91	8.86	1.99	4.50	1.01	3.39	0.76
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	60.94	13.70	41.77	9.39	61.69	13.87	42.48	9.55
Maximum	76.06	17.10	48.66	10.94	77.26	17.37	47.59	10.70
Average	67.01	15.07	44.86	10.09	66.62	14.98	45.04	10.13
St Dev	4.75	1.07	2.76	0.62	4.88	1.10	2.14	0.48
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	Newtons	Force (Lbs)	Newtons	Force (Lbs)				
Minimum	62.01	13.94	42.61	9.58				
Maximum	73.75	16.58	49.37	11.10				
Average	66.64	14.98	45.67	10.27				
St Dev	4.24	0.95	2.11	0.47				
Count	8	8	8	8				

DATA SUMMARIES Continued**Mating-Unmating Durability Group 4 (UMPS-07-05.5-T-V-S-W-XR/UMPT-07-06.5-T-V-S-W-XR)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	37.14	8.35	25.40	5.71	40.97	9.21	27.67	6.22
Maximum	41.41	9.31	42.61	9.58	48.84	10.98	37.14	8.35
Average	39.63	8.91	32.56	7.32	43.89	9.87	31.18	7.01
St Dev	1.71	0.38	7.14	1.60	2.59	0.58	2.81	0.63
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	41.59	9.35	30.47	6.85	42.26	9.50	31.27	7.03
Maximum	50.48	11.35	37.41	8.41	49.60	11.15	38.43	8.64
Average	45.78	10.29	32.63	7.34	46.28	10.40	32.80	7.38
St Dev	2.68	0.60	2.16	0.49	2.75	0.62	2.42	0.54
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	Newtons	Force (Lbs)	Newtons	Force (Lbs)				
Minimum	42.97	9.66	29.58	6.65				
Maximum	49.86	11.21	39.54	8.89				
Average	46.16	10.38	32.40	7.29				
St Dev	2.59	0.58	3.08	0.69				
Count	8	8	8	8				

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: 3/5/2020, Next Cal: 3/4/2021**Equipment #:** HZ-MO-01**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 2700**Serial #:** 1199807**Accuracy:** Last Cal: 05/19/2020, Next Cal: 05/18/2021**Equipment #:** HZ-PS-01**Description:** Power Supply**Manufacturer:** Agilent**Model:** 6031A**Serial #:** MY41000982**Accuracy:** Last Cal: 04/16/2020, Next Cal: 04/15/2021