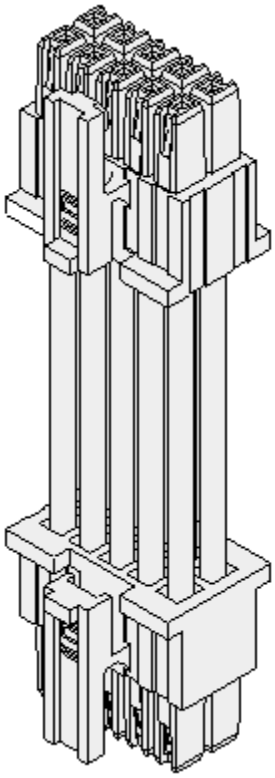
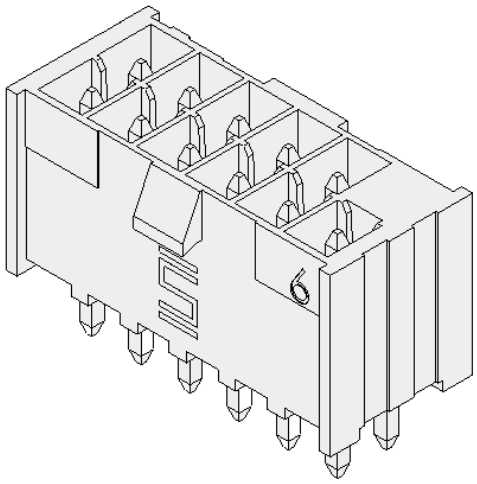
Project Number: 201899	Tracking Code: 201899 Power Report Rev 3		
Requested by: Eric Mings	Date: 5/28/2013	Product Rev: AE	
Part #: MMSD-25-26-L-12.00-D-K-LUS	Lot #: N/A	Tech: Tony Wagoner	Eng: Eric Mings
Part description: 0.100[2.54] Socket Discrete Cable Assembly			Qty to test: 23
Test Start: 8/3/2012	Test Completed: 10/1/2012		

SAMTEC POWER CHARACTERIZATION





0.100 [2.54] Socket Discrete Cable Assembly

MMSD-25-26-L-12.00-D-K-LUS
IPL1-125-01-L-D-K

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

1. Temperature Rise/Current Carrying Capacity
   - 1.1. To determine the amount of current the device under test (DUT) can safely carry over the operating temperature range of the DUT.
   - 1.2. Contact loading will also be addressed in this document which will determine how much current can be carried as the number of energized contacts is varied.

2. Current Cycling
   - 2.1. To determine the performance of the device under test (DUT) when subjected to the power-on/power-off cycling that heats and cools the DUT in normal everyday use.
   - 2.2. Contact loading will set to 100% throughout the test.

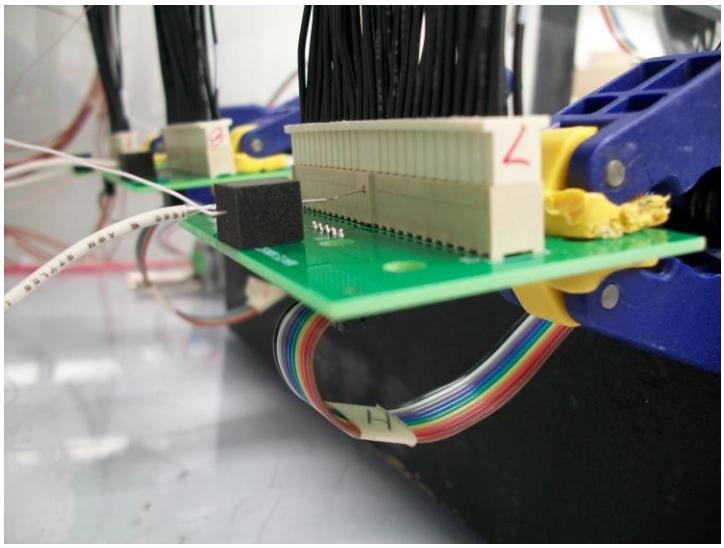
APPLICABLE DOCUMENTS

Standards: EIA Publication 364-70 Temperature Rise
EIA Publication 364-06 Contact Resistance
EIA Publication 364-55 Current Cycling
TLPM-032 Current Carrying Capacity
TLPM-084 Current Cycling
IEC 512-3 Electromechanical Components for Electronic Equipment: Basic Testing Procedures and Measuring Methods, Part 3: Current Carrying Capacity Tests

TEST SAMPLES AND PREPARATION

1. All materials shall be manufactured in accordance with the applicable product specification.
2. All test samples shall be identified and encoded to maintain traceability throughout the test sequences.
3. After soldering, the parts to be used shall be cleaned according to TLWI-0001.
4. All samples shall be visually inspected and cleaned as necessary.
5. Any additional preparation shall be noted in the individual test sequences.
6. Solder Information: Lead Free
7. Re-Flow Time/Temp: See accompanying profile.
8. All products designed to operate mounted on a printed circuits board shall be tested mounted to test boards in accordance with EIA-364-70.

PREPARED TEST SAMPLE



9. The following loading configurations shall be tested for Temperature Rise/Current Carrying Capacity testing of two row connector systems:
    - 9.1. Two by One contact energized
    - 9.2. Two by Two contacts energized adjacent to each other
    - 9.3. Two by Three contacts energized adjacent to each other
    - 9.4. Two by Four contacts energized adjacent to each other
    - 9.5. All contacts energized

Test Condition as in 10.1 above

✧ Indicates energized contacts

✦ Indicates thermocouple monitored, energized contacts

✧			
✦			

10. For Current Cycling, only 100 % loading will be tested.

FLOWCHARTS

Current Carrying Capacity 3 Mated Assemblies Each

TEST STEP	GROUP A 3 Mated Assemblies 2 CONTACTS POWERED	GROUP B 3 Mated Assemblies 4 CONTACTS POWERED	GROUP C 3 Mated Assemblies 6 CONTACTS POWERED	GROUP D 3 Mated Assemblies 8 CONTACTS POWERED	GROUP E 3 Mated Assemblies ALL CONTACTS POWERED
01	CCC	CCC	CCC	CCC	CCC

(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 105° C
CCC, Temp rise = EIA-364-70

Current Cycling

TEST STEP	GROUP A 8 Mated Assembies ALL CONTACTS POWERED
01	Current Cycle, 500 cycles at 125% of Rated current

Current Cycle = EIA 364-55, Condition "B", Method #4
Test at Current 125% of Rated Current
Measure at 45 minutes into ON time of cycle
Measure Voltage Drop on 5 random contacts

TEST PROCEDURES

Part No.	MMSD-25-26-L-12.00-D-K-LUS	Mating Part No.	IPL1-125-01-L-D-K
Sample Size	15	Technician	Tony Wagoner
Start Date	8/3/2012	Complete Date	8/9/2012
Room Ambient	22°C	Relative Humidity	48%
Equipment ID#: MO-04, PS-11, RS-10, RS-11, TC111307-TCS(019, 027, 033, 015, 020, 009, 008, 007, 001, 002, 003, 016)			

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1. Thermocouples shall be calibrated in accordance with Samtec documents; TLWI 0003, Thermocouple Welding Procedure and TLWI 0005, Thermocouple Calibration
2. The thermocouples shall be placed at a location to sense the maximum temperature generated during testing.
3. Temperature stability shall be defined as the temperature at which three successive readings, 5 minutes apart, differ not more than 1° C (computer controlled data acquisition). This is the Temperature Rise that the Current Carrying Capacity and De-rating curves are based on.
4. The following loading configurations shall be tested (double for two row systems):
   a) One contact energized only
   b) Two contacts energized adjacent to each other
   c) Three contacts energized adjacent to each other
   d) Four contacts energized adjacent to each other
   e) All contacts energized
5. The following loading configurations shall be tested for Temperature Rise/Current Carrying Capacity testing of two row connector systems:
   a) Two by One contact energized
   b) Two by Two contacts energized adjacent to each other
   c) Two by Three contacts energized adjacent to each other
   d) Two by Four contacts energized adjacent to each other
   e) All contacts energized
6. Three samples shall be tested for each of the above configurations for a total of eighteen assemblies.
7. Temperature Rise measurements shall be made at 5 different current levels yielding temperature rises in the 10 to 70°C range.
8. The base curve for the Current Rating chart will be derived from the average (maximum) value of three test specimens in accordance with IEC 512-3, Test 5b.

Part No.	**MMSD-25-26-L-12.00-D-K-LUS**	**Mating Part No.**	**IPL1-125-01-L-D-K**
Sample Size	**8**	**Technician**	**Tony Wagoner**
Start Date	**9/10/2012**	**Complete Date**	**10/1/2012**
Room Ambient	**22°C**	**Relative Humidity**	**48%**
Equipment ID#: MO-10,PS-05, TC111307-TCS(-003,-004,005,-006,-002,-020), THL-10; RS-03			

CURRENT CYCLING

1. Samples shall be prepared and tested as above (paragraph 14.5).
2. Current Cycling shall be performed in accordance with EIA-364-55, Test Condition
3. Testing shall be as follows:
   - 3.1. Test Current: **TEST CURRENT**(125% of 30°C Rating)
   - 3.2. "ON" Time: 45 Minutes
   - 3.3. "OFF" Time: 15 Minutes
   - 3.4. Number of Cycles: 500
   - 3.5. Measurements: 40 minutes into ON cycle
     - 3.5.1. Temperature
     - 3.5.2. Voltage Drop/Contact Resistance
4. Temperature vs. Number of Cycles and Voltage Drop vs. Number of Cycles shall be measured and recorded.

TEST RESULTS

CURRENT CARRYING CAPACITY (CCC) RESULTS

- **There was no evidence of physical damage to the test samples as tested.**
- **The following is a summary of the observed data:**

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise ----------3.5A per contact with 2 contacts (2 x 1) powered**
- **CCC for a 30°C Temperature Rise ----------2.9A per contact with 4 contacts (2 x 2) powered**
- **CCC for a 30°C Temperature Rise ----------2.5A per contact with 6 contacts (2 x 3) powered**
- **CCC for a 30°C Temperature Rise ----------2.3A per contact with 8 contacts (2 x 4) powered**
- **CCC for a 30°C Temperature Rise ----------1.5A per contact with 50 contacts (2 x 25) powered**

CURRENT CYCLING RESULTS

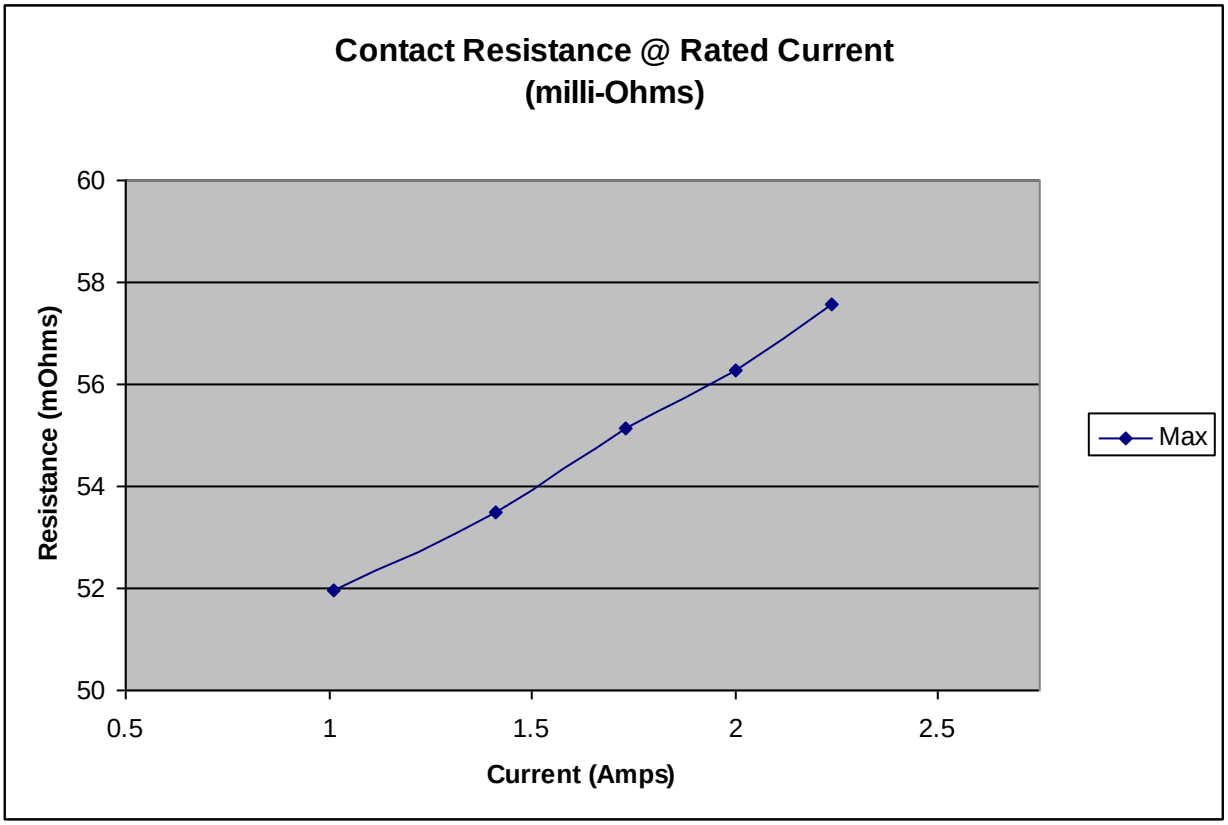
Test Condition: 500 Cycles, 45 minutes ON and 15 minutes OFF

- **Test Current ---------- 1.9 Amps**
- **Contact Resistances, Measured 40 minutes into the FIRST and LAST ON cycle**
  - **Initial**
    - **Min ----------52.20 mOhms**
    - **Max----------57.55 mOhms**
  - **Final**
    - **Min ----------57.11 mOhms**
    - **Max----------57.25 mOhms**
- **Temperature Change, Measured 40 minutes into the FIRST and LAST ON cycle**
  - **Initial Temperature Change ----------26.8°C**
  - **Final Temperature Change ----------26.1°C**

TEST DATA

CONTACT RESISTANCE @ RATED CURRENT - DC Resistance (DCR)

The following data represents the Voltage drop and Contact Resistance at Rated Current for the 100% energized samples:

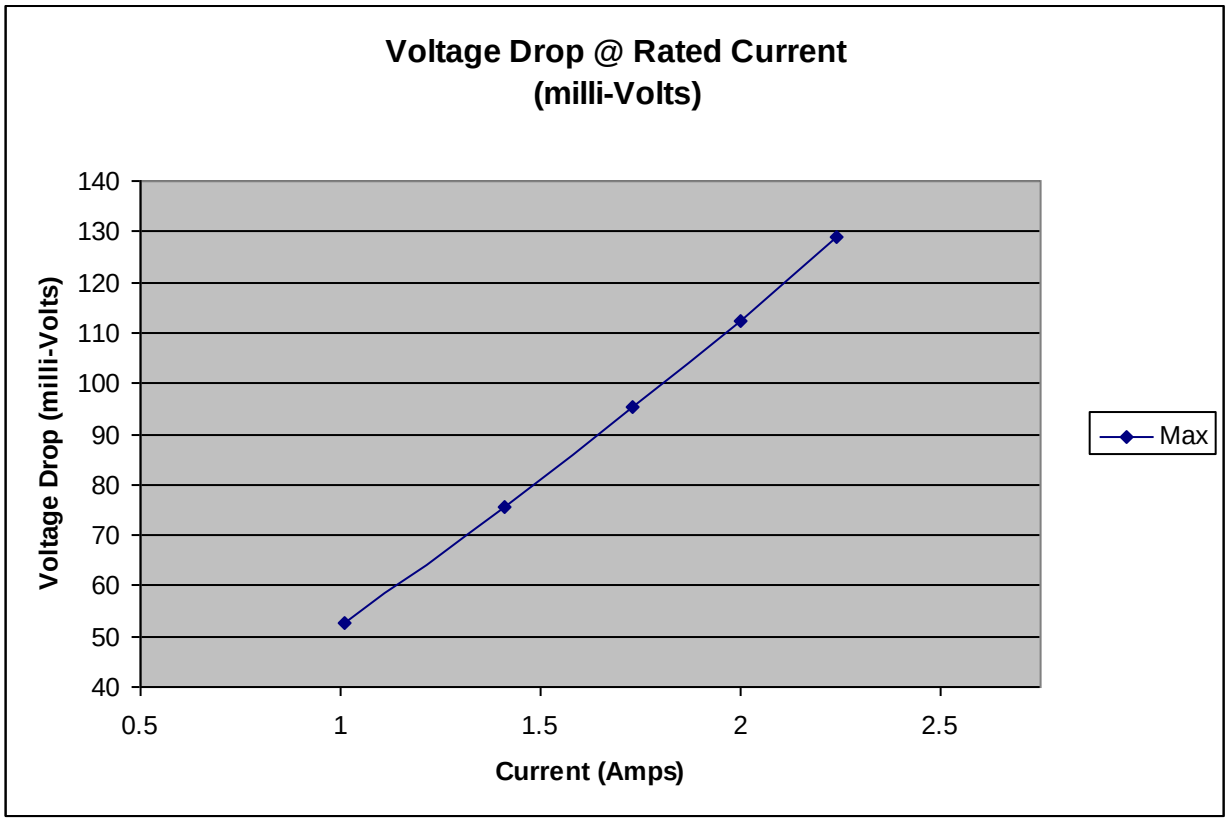


CONTACT RESISTANCE DATA ALL CONTACTS ENERGIZED (mΩ)					
TEST CURRENT AMPS	1.01	1.41	1.73	2	2.24
Min	49.29	50.38	51.6	52.4	53.41
Max	51.97	53.49	55.12	56.26	57.58
Avg	50.74	52.2	53.84	54.95	56.21

TEST DATA

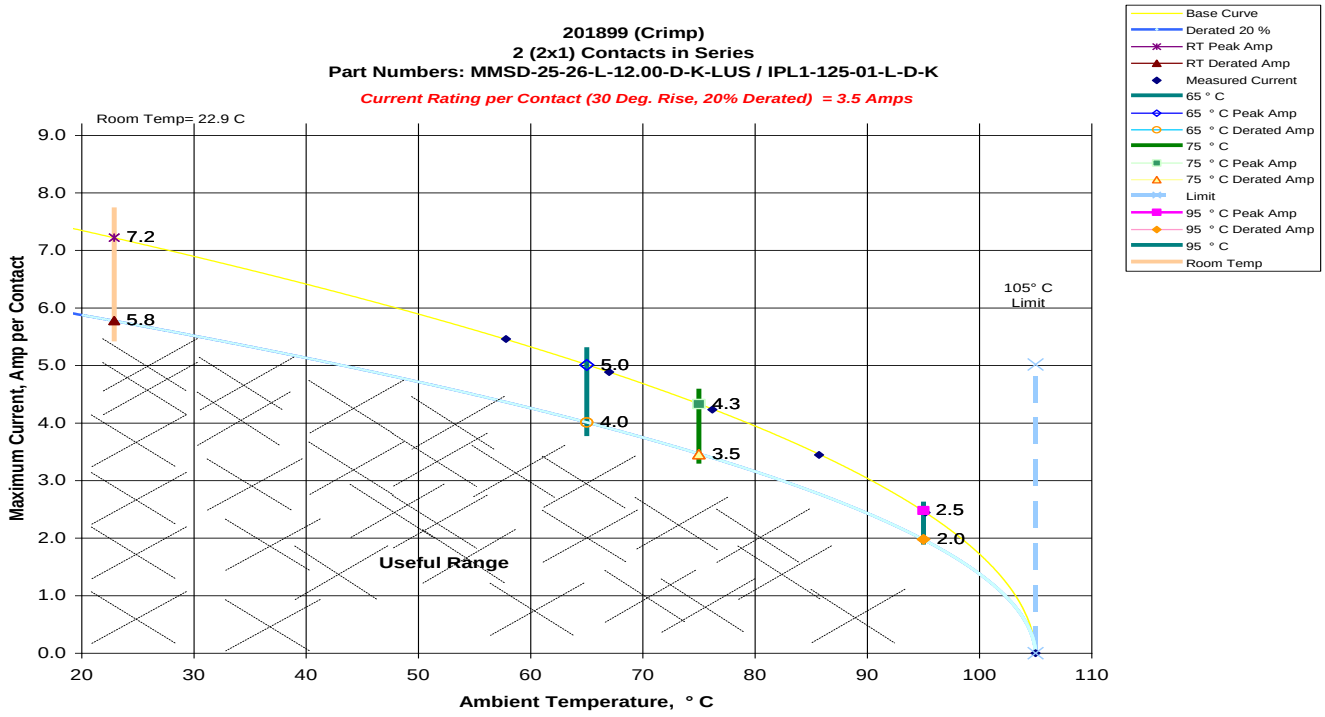
VOLTAGE DROP @ RATED CURRENT

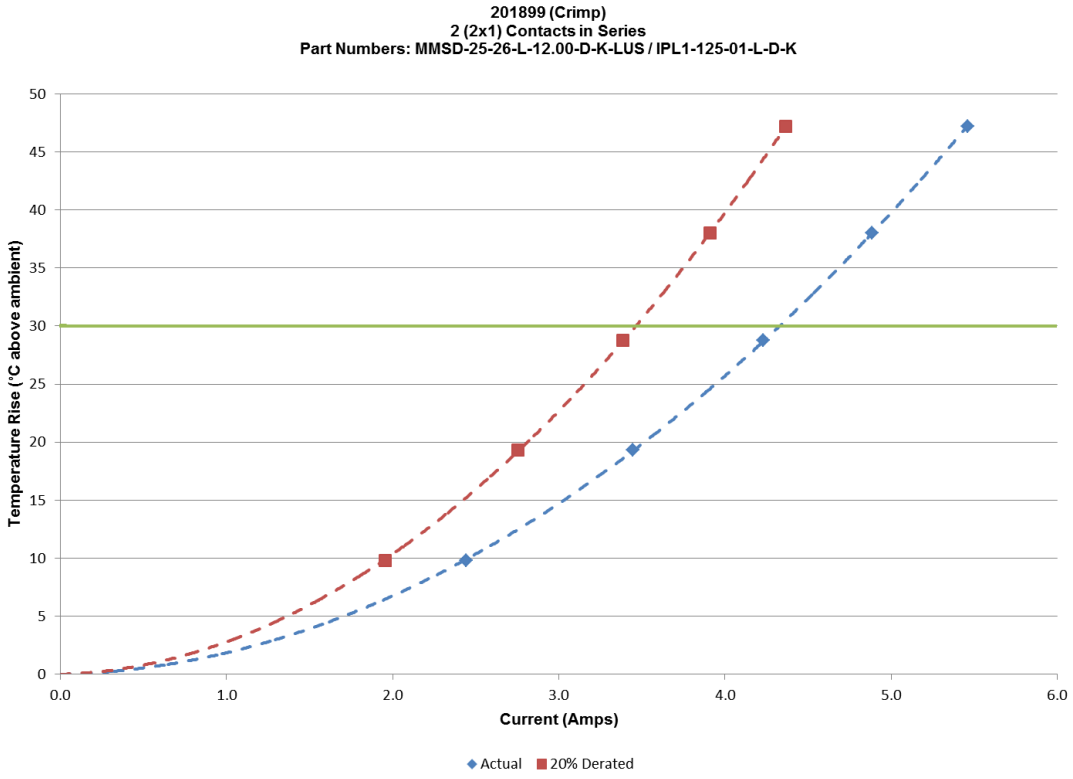
The following data represents the Voltage drop at Rated Current for the 100% energized samples:



VOLTAGE DROP DATA ALL CONTACTS ENERGIZED (mV)					
TEST CURRENT AMPS	1.01	1.41	1.73	2	2.24
Min	49.78	71.04	89.26	106.83	119.63
Max	52.49	75.42	95.35	112.51	128.99
Avg	51.22	73.49	92.88	109.53	125.42

CURRENT CARRYING CAPACITY DATA





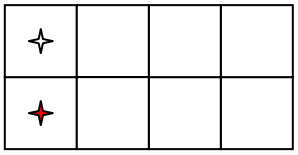
TEMPERATURE RISE DATA
TWO CONTACTS ENERGIZED
(Degrees Celsius above ambient)

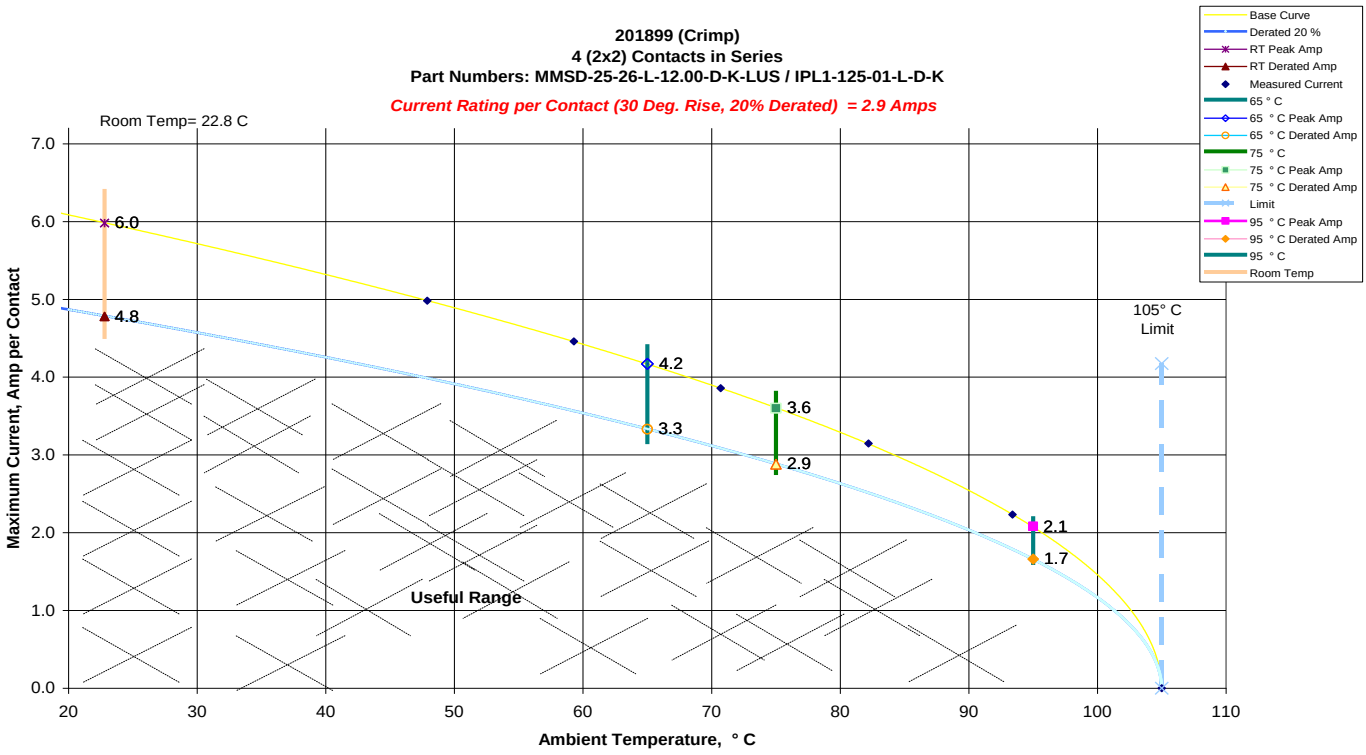
TEST CURRENT AMPS	2.44	3.44	4.23	4.89	5.46
Sample 1	10.7	21.1	31	41	51.8
Sample 2	11.5	22.4	33.2	43.8	53.5
Sample 3	11.5	22.3	33.5	44.1	54.5
Min	10.7	21.1	31	41	51.8
Max	11.5	22.4	33.5	44.1	54.5
Avg	11.23	21.93	32.57	42.97	53.27

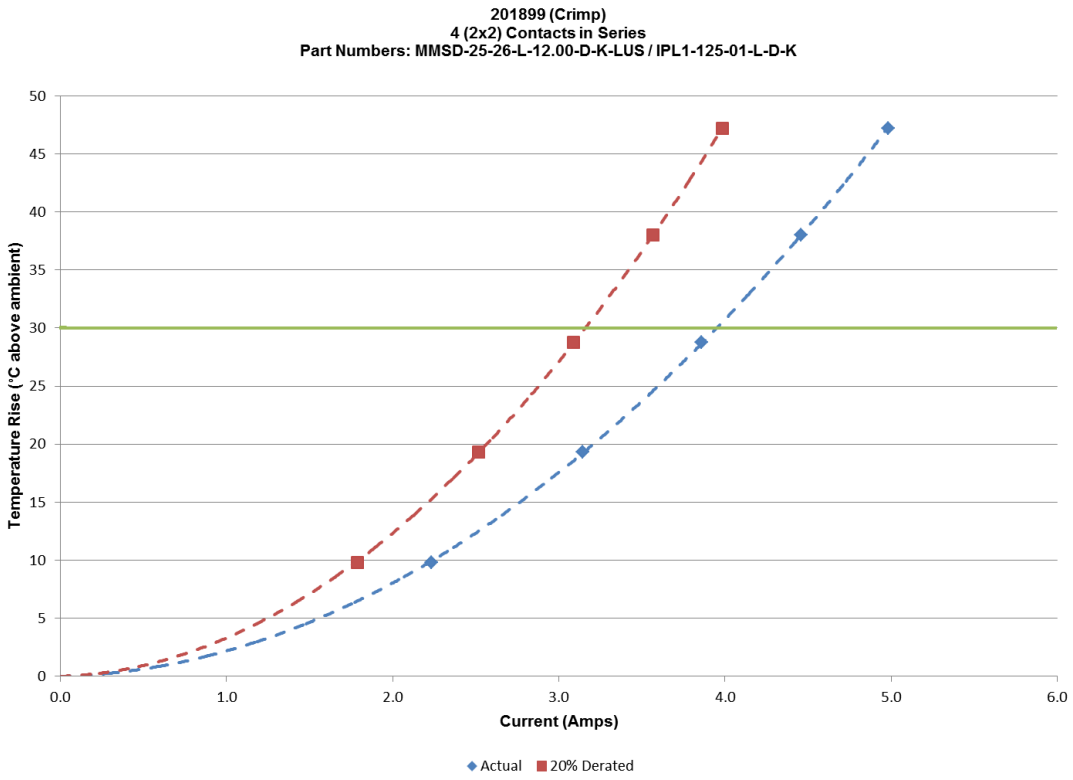
Double Row Configuration

✧ Indicates energized contacts

✦ Indicates thermocouple monitored, energized contacts



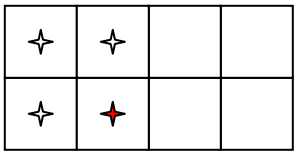

201899 (Crimp)
4 (2x2) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.9 Amps
Room Temp= 22.8 C
Maximum Current, Amp per Contact
Ambient Temperature, ° C
Useful Range
105° C Limit
6.0
4.8
4.2
3.3
3.6
2.9
2.1
1.7
Base Curve
Derated 20 %
RT Peak Amp
RT Derated Amp
Measured Current
65 ° C
65 ° C Peak Amp
65 ° C Derated Amp
75 ° C
75 ° C Peak Amp
75 ° C Derated Amp
Limit
95 ° C Peak Amp
95 ° C Derated Amp
95 ° C
Room Temp

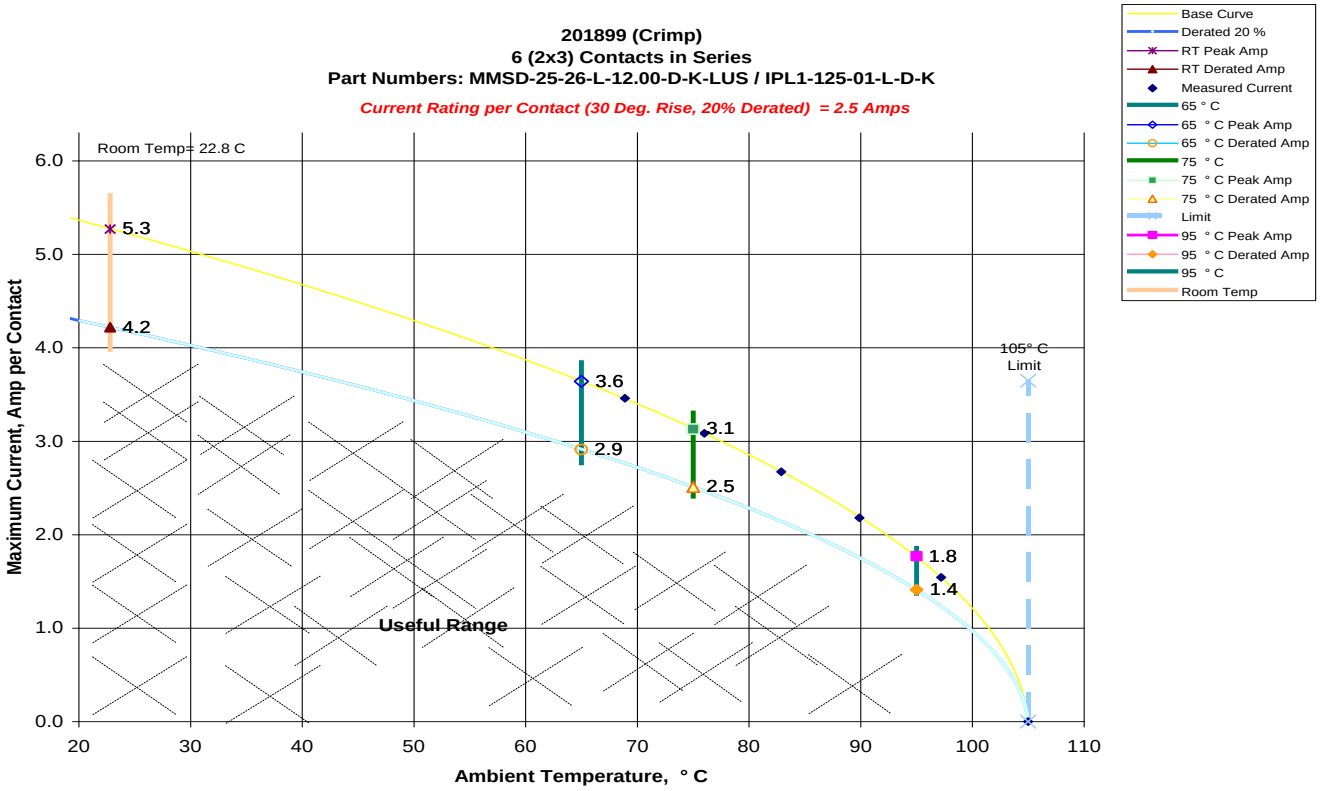

201899 (Crimp)
4 (2x2) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Temperature Rise (°C above ambient)
Current (Amps)
Actual
20% Derated

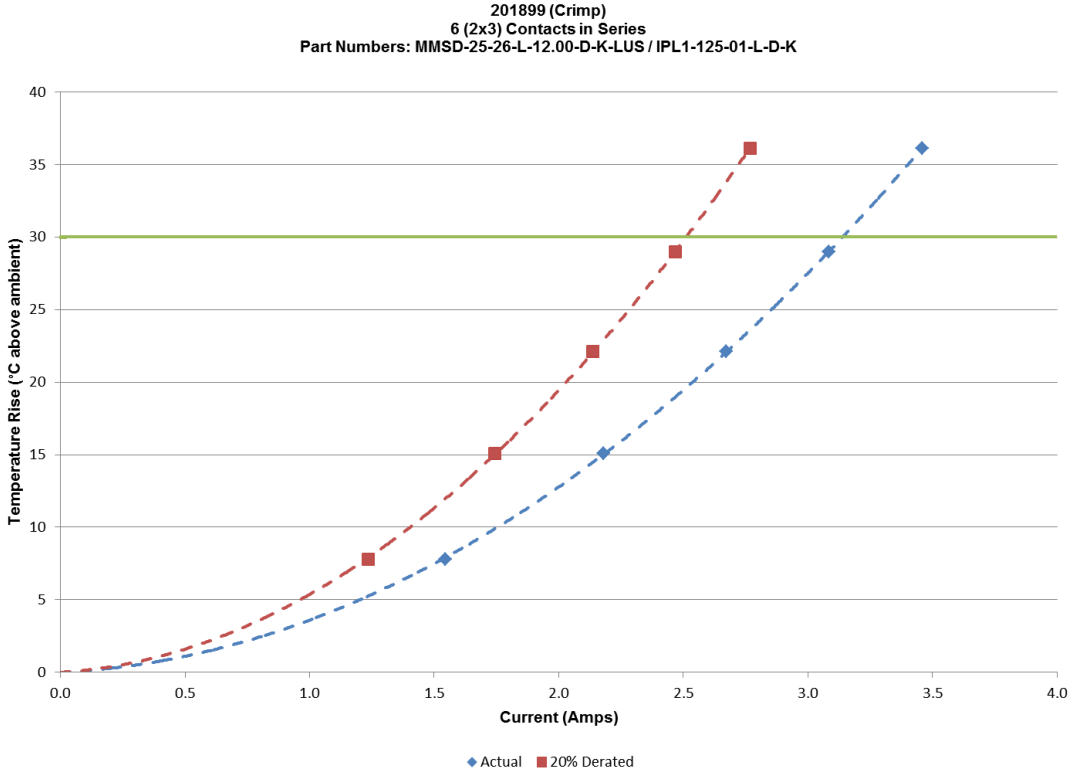
TEMPERATURE RISE DATA FOUR CONTACTS ENERGIZED (Degrees Celsius above ambient)					
TEST CURRENT AMPS	2.23	3.15	3.86	4.46	4.98
Sample 4	12.2	24.4	37.4	47.5	61.9
Sample 5	12.7	25.3	37.9	50.3	62.5
Sample 6	12.8	24.7	36.6	50.2	61.2
Min	12.2	24.4	36.6	47.5	61.2
Max	12.8	25.3	37.9	50.3	62.5
Avg	12.57	24.8	37.3	49.33	61.87

✧ Indicates energized contacts

✦ Indicates thermocouple monitored, energized contacts



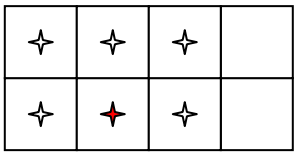

201899 (Crimp)
6 (2x3) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.5 Amps
Room Temp= 22.8 C
5.3
4.2
3.6
2.9
3.1
2.5
1.8
1.4
105° C Limit
Useful Range
Maximum Current, Amp per Contact
Ambient Temperature, ° C
Base Curve
Derated 20 %
RT Peak Amp
RT Derated Amp
Measured Current
65 ° C
65 ° C Peak Amp
65 ° C Derated Amp
75 ° C
75 ° C Peak Amp
75 ° C Derated Amp
Limit
95 ° C Peak Amp
95 ° C Derated Amp
95 ° C
Room Temp

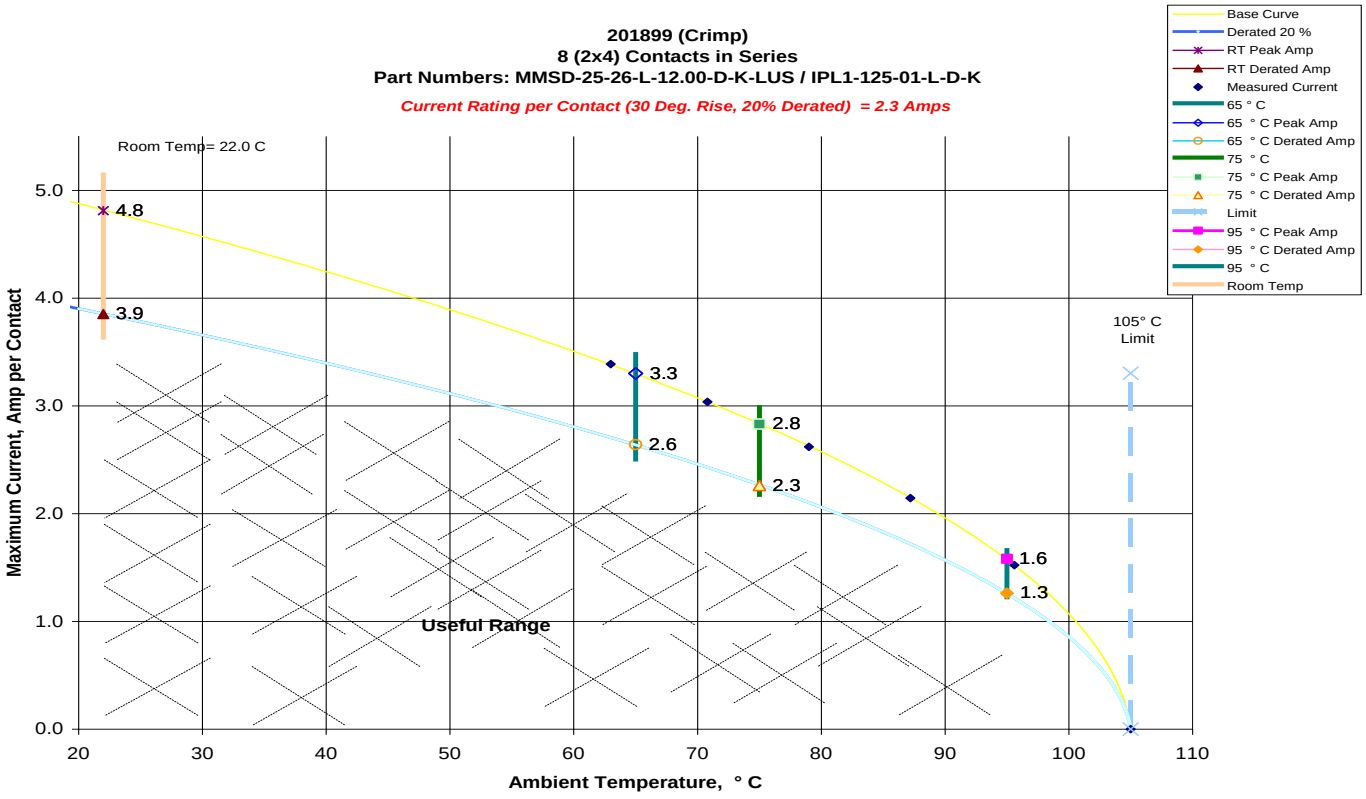

201899 (Crimp)
6 (2x3) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Temperature Rise (°C above ambient)
Current (Amps)
Actual
20% Derated

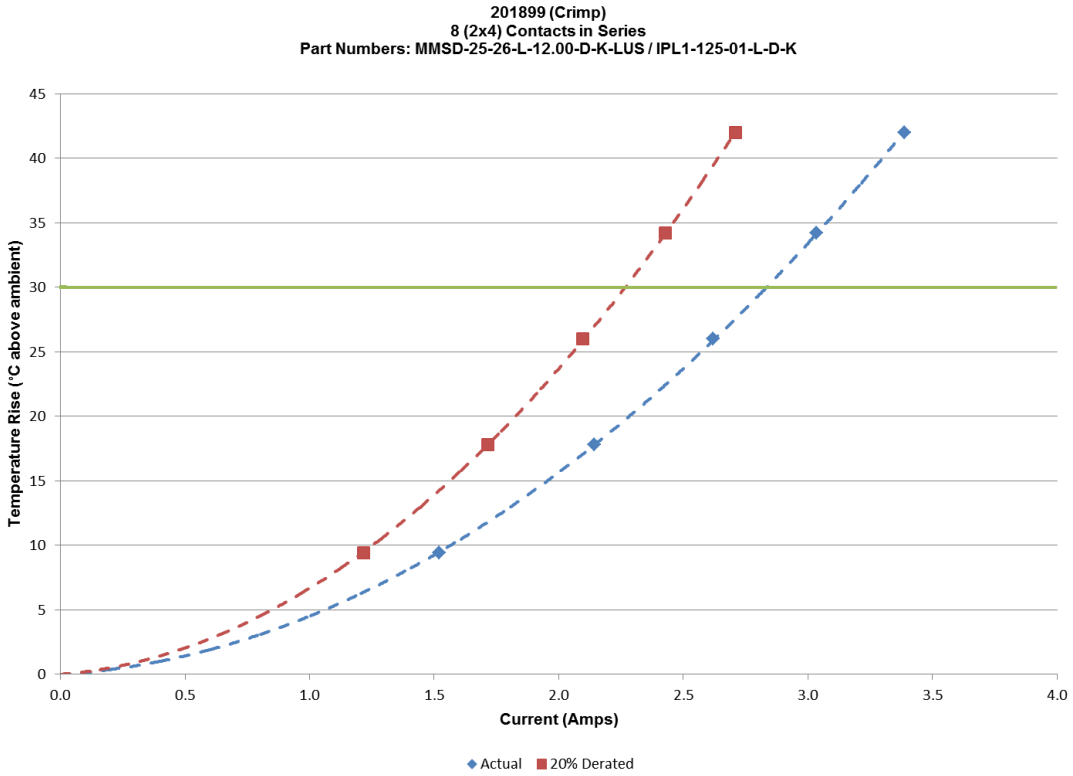
TEMPERATURE RISE DATA SIX CONTACTS ENERGIZED (Degrees Celsius above ambient)					
TEST CURRENT AMPS	1.54	2.18	2.67	3.08	3.46
Sample 7	7.9	15.4	22.8	30.1	37.7
Sample 8	7.8	14.8	21.2	27.6	34.2
Sample 9	7.6	15.1	22.4	29.4	36.3
Min	7.6	14.8	21.2	27.6	34.2
Max	7.9	15.4	22.8	30.1	37.7
Avg	7.77	15.1	22.13	29.03	36.07

Indicates energized contacts

Indicates thermocouple monitored, energized contacts



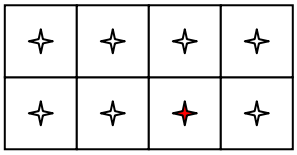

201899 (Crimp)
8 (2x4) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.3 Amps
Room Temp= 22.0 C
4.8
3.9
3.3
2.6
2.8
2.3
1.6
1.3
105° C Limit
Useful Range
Maximum Current, Amp per Contact
Ambient Temperature, ° C
Base Curve
Derated 20 %
RT Peak Amp
RT Derated Amp
Measured Current
65 ° C
65 ° C Peak Amp
65 ° C Derated Amp
75 ° C
75 ° C Peak Amp
75 ° C Derated Amp
Limit
95 ° C Peak Amp
95 ° C Derated Amp
95 ° C
Room Temp

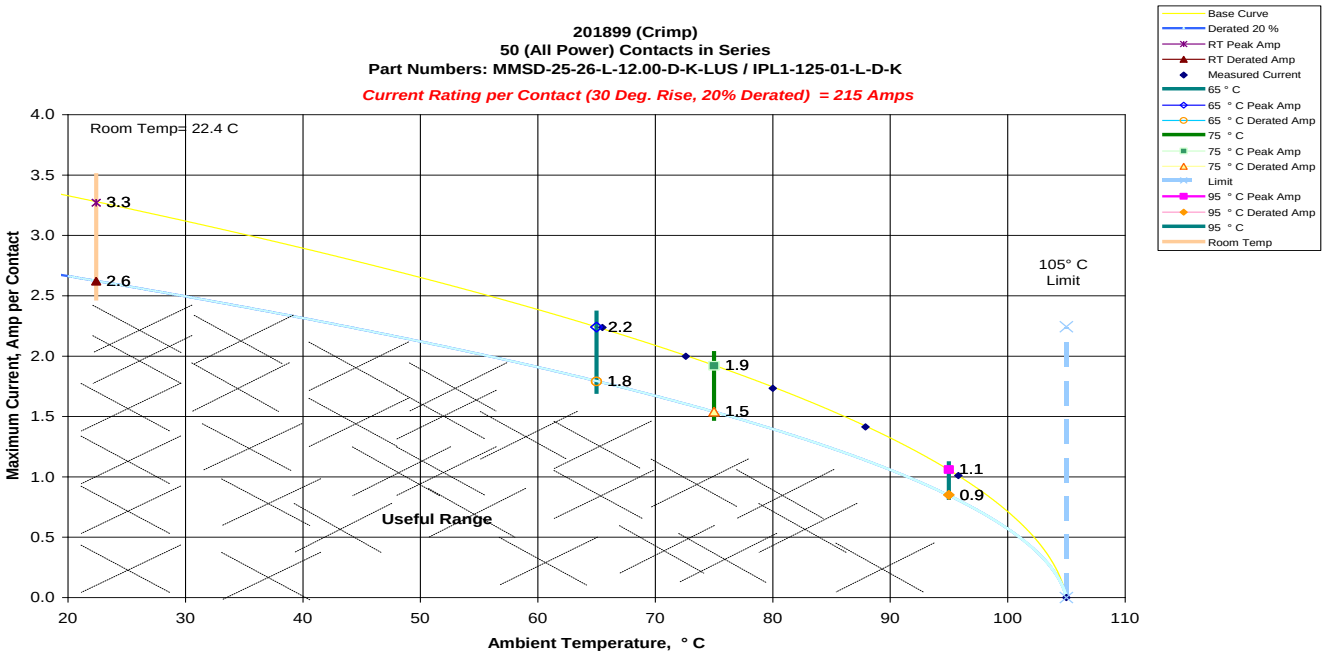

201899 (Crimp)
8 (2x4) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Temperature Rise (°C above ambient)
Current (Amps)
Actual
20% Derated

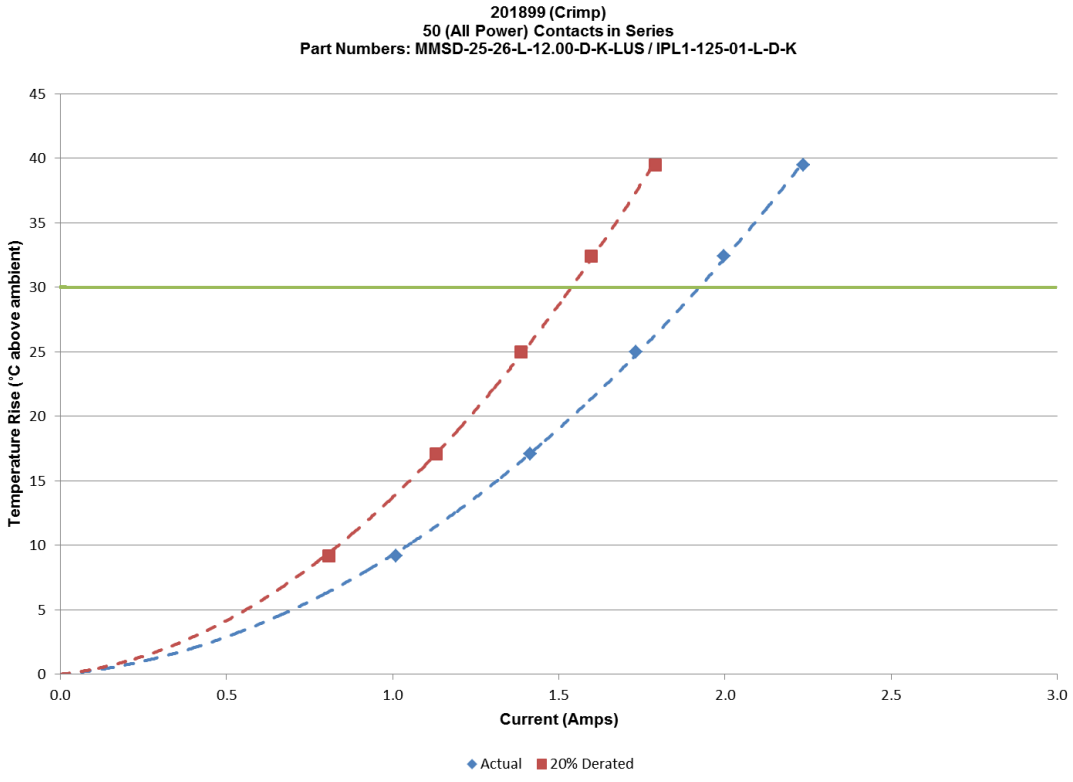
TEMPERATURE RISE DATA EIGHT CONTACTS ENERGIZED (Degrees Celsius above ambient)					
TEST CURRENT AMPS	1.31	1.85	2.26	2.61	2.92
Sample 10	6.5	14.6	21.5	28	34.9
Sample 11	6.1	12.8	19.1	25.2	30.6
Sample 12	6.4	14.3	21.1	28	34.2
Min	6.1	12.8	19.1	25.2	30.6
Max	6.5	14.6	21.5	28	34.9
Avg	6.33	13.9	20.57	27.07	33.23

Indicates energized contacts

Indicates thermocouple monitored, energized contacts



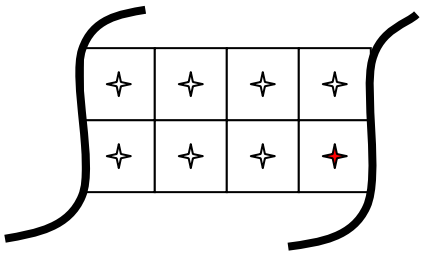

201899 (Crimp)
50 (All Power) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 215 Amps
Room Temp= 22.4 C
Maximum Current, Amp per Contact
Ambient Temperature, ° C
Useful Range
105° C Limit
3.3
2.6
2.2
1.8
1.9
1.5
1.1
0.9
Base Curve
Derated 20 %
RT Peak Amp
RT Derated Amp
Measured Current
65 ° C
65 ° C Peak Amp
65 ° C Derated Amp
75 ° C
75 ° C Peak Amp
75 ° C Derated Amp
Limit
95 ° C Peak Amp
95 ° C Derated Amp
95 ° C
Room Temp

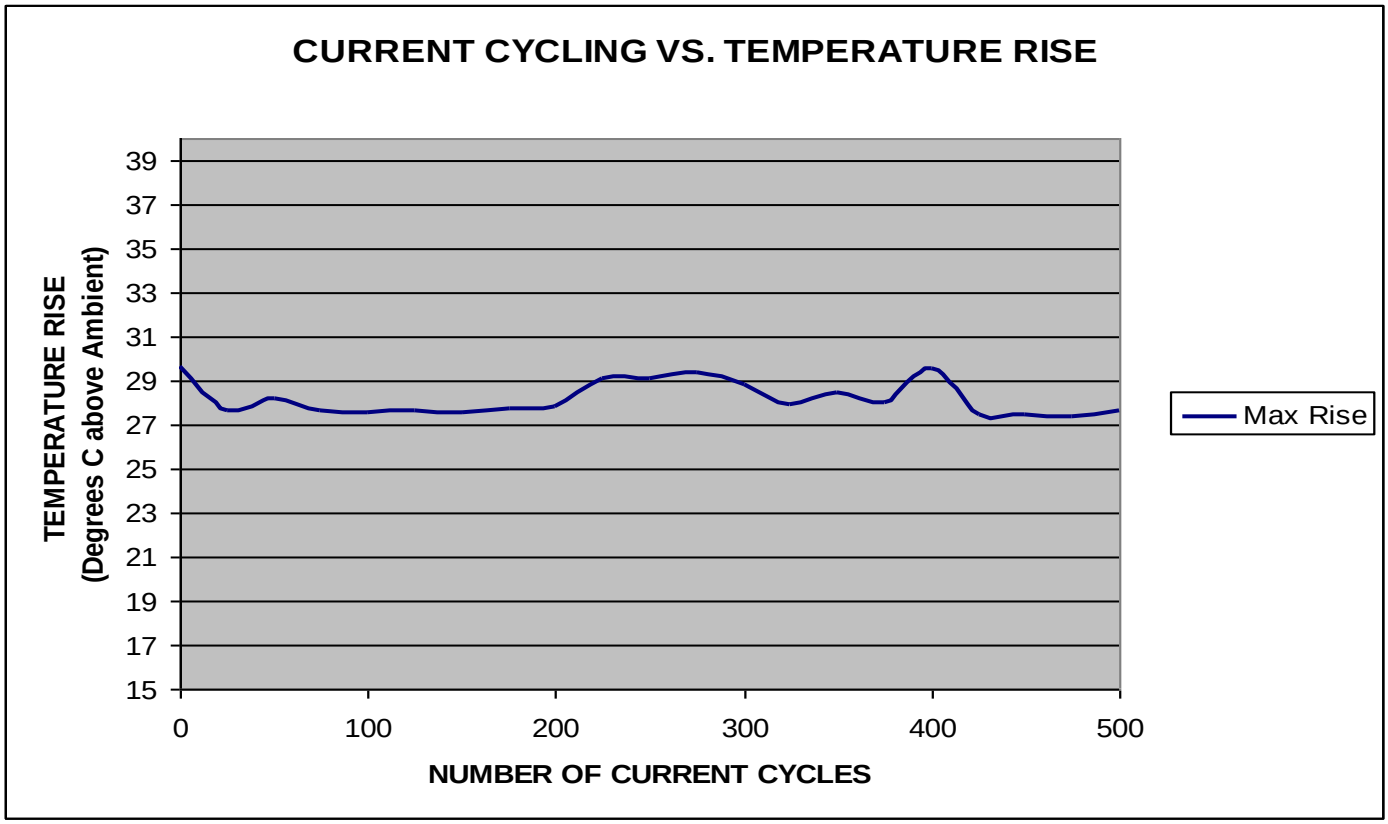

201899 (Crimp)
50 (All Power) Contacts in Series
Part Numbers: MMSD-25-26-L-12.00-D-K-LUS / IPL1-125-01-L-D-K
Temperature Rise (°C above ambient)
Current (Amps)
Actual
20% Derated

TEMPERATURE RISE DATA ALL CONTACTS ENERGIZED (Degrees Celsius above ambient)					
TEST CURRENT AMPS	1.01	1.41	1.73	2	2.24
Sample 13	9	16.8	24.8	32.1	38.9
Sample 14	9.1	16.9	24.7	32.3	39.3
Sample 15	9.4	17.5	25.5	32.9	40.4
Min	9	16.8	24.7	32.1	38.9
Max	9.4	17.5	25.5	32.9	40.4
Avg	9.17	17.07	25	32.43	39.53

Indicates energized contacts

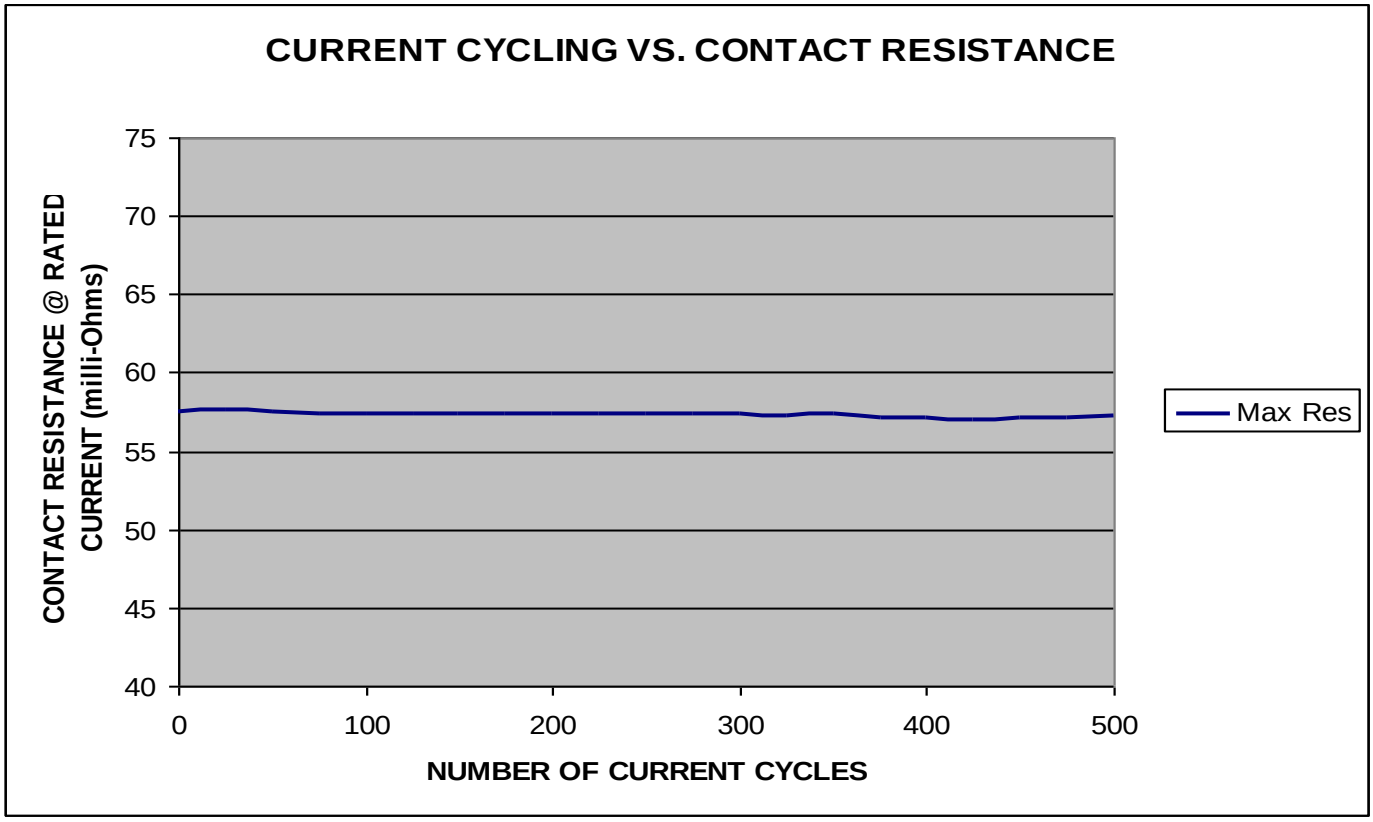
Indicates thermocouple monitored, energized contacts





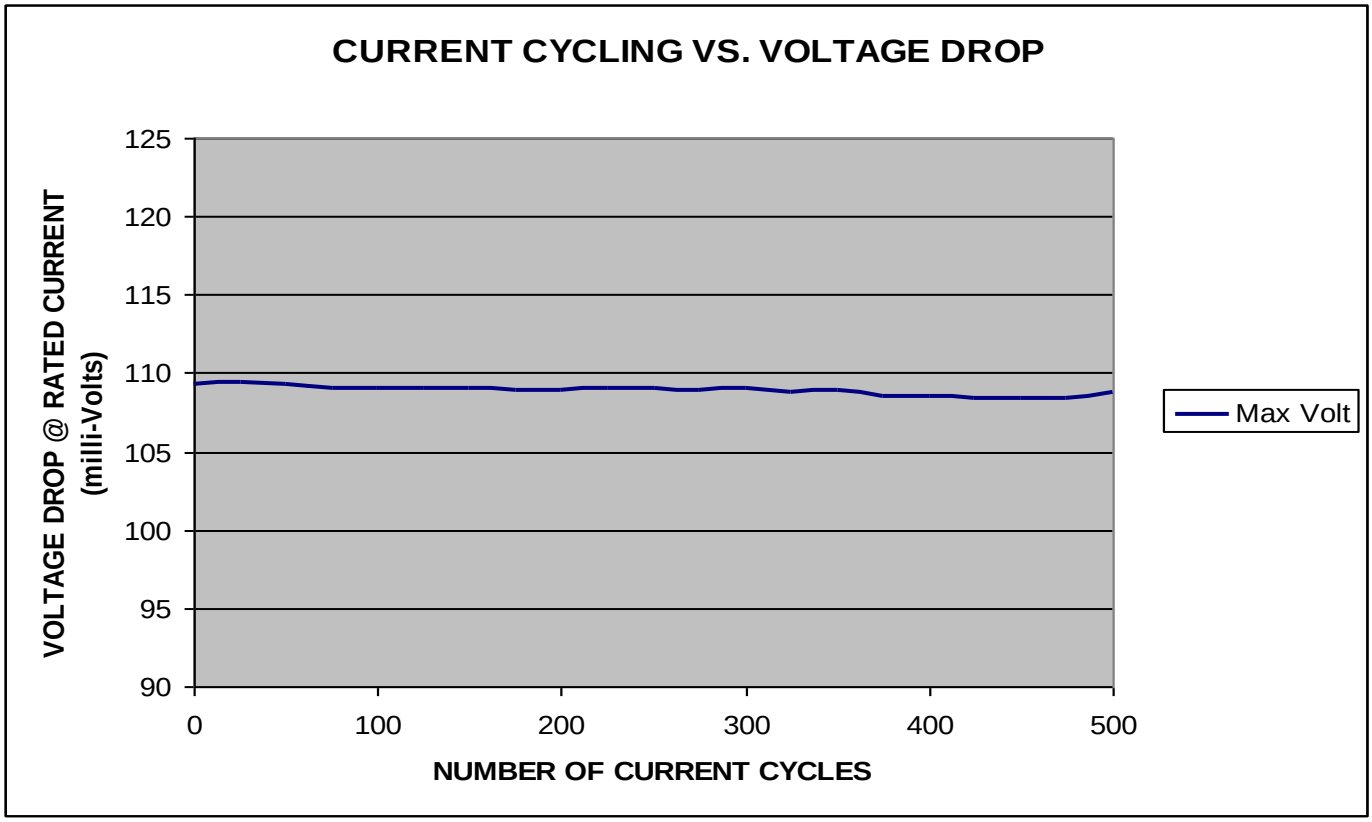
TEMPERATURE RISE DATA
ALL CONTACTS ENERGIZED
(Degrees Celsius above ambient)

	INITIAL	50 CYCLES	100 CYCLES	200 CYCLES	500 CYCLES
Min	24.6	24.4	24.2	24.3	24.4
Max	29.6	28.2	27.5	27.8	27.6
Avg	26.8	26.4	26.2	26.3	26.1



CONTACT RESISTANCE DATA
ALL CONTACTS ENERGIZED
(mΩ)

	INITIAL	50 CYCLES	100 CYCLES	200 CYCLES	500 CYCLES
Min	52.2	52.3	52.34	52.19	52.11
Max	57.55	57.51	57.42	57.34	57.25
Avg	55.35	55.4	55.33	55.28	55.17



VOLTAGE DROP DATA
ALL CONTACTS ENERGIZED
(MV)

	INITIAL	50 CYCLES	100 CYCLES	200 CYCLES	500 CYCLES
Min	99.18	99.37	99.44	99.17	99.01
Max	109.35	109.27	109.09	108.95	108.77
Avg	105.16	105.26	105.12	105.03	104.83

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: MO-04
Description: Model 2700 Multimeter/Data Acquisition System (Integra Series)
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 3/27/2012, Next Cal: 3/27/2013

Equipment #: MO-10
Description: Model 2750 Multimeter/Switch System (Integra Series)
Manufacturer: Keithley
Model: 2750
Serial #: 1215161
Accuracy: See Manual
… Last Cal: 10/18/2011, Next Cal: 10/18/2012

Equipment #: PS-04
Description: 60V, 50A DC Power Supply-AutoRanging SO
Manufacturer: Hewlett Packard/ Agilent
Model: AT-6032A
Serial #: MY41001186
Accuracy: See Manual

Equipment #: PS-11
Description: 100V, 7.5A, 750W System DC Power Supply
Manufacturer: Agilent Technologies
Model: N57491
Serial #: US11M7700J
Accuracy: See Manual

Equipment #: RS-03
Description: Shunt
Manufacturer: EMPRO
Model: HA5050
Serial #: HA5050
Accuracy: ± 0.25% RDG
… Last Cal: 5/30/2012, Next Cal: 5/30/2013

Equipment #: RS-11
Description: Shunt
Manufacturer: Vishay
Model: VCS202
Serial #: VCS202
Accuracy: ± 1% RDG
… Last Cal: 5/30/2012, Next Cal: 5/30/2013

Equipment #: RS-10
Description: Shunt
Manufacturer: EMPRO
Model: HA10050
Serial #: HA10050
Accuracy: ± 0.25% RDG
… Last Cal: 5/30/2012, Next Cal: 5/30/2013

Equipment #: TC111307-TCS(-002—027)
Description: Calibrated Thermocouples
Manufacturer: Samtec, Inc.
Model:
Serial #:
Accuracy:
… Last Cal: 5/16/2012, Next Cal: 5/16/2013