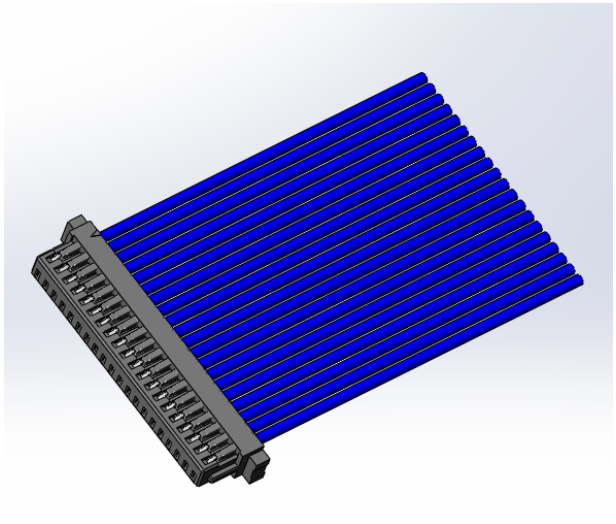
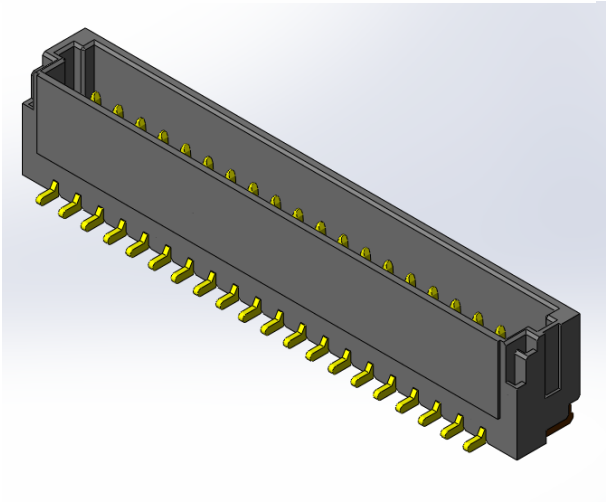
Project Number: Design Qualification Test Report	Tracking Code: 305477_Report_Rev_1
Requested by: Catie Eichhorn	Date: 12/13/2017
Part #: S1SST-20-28-GF-12.00-D-NUS /T1M-20-GF-S-V-TR	Tech: Tony Wagoner
Part description: S1SST/T1M	Qty to test: 15
Test Start: 02/26/2014	Test Completed: 03/21/2014





DESIGN QUALIFICATION TEST REPORT

S1SST/T1M

S1SST-20-28-GF-12.00-D-NUS /T1M-20-GF-S-V-TR

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
03/27/2014	**1**	**Initial Issue**	**PC**

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

To perform the following tests: Design Qualification test. Please see test plan.

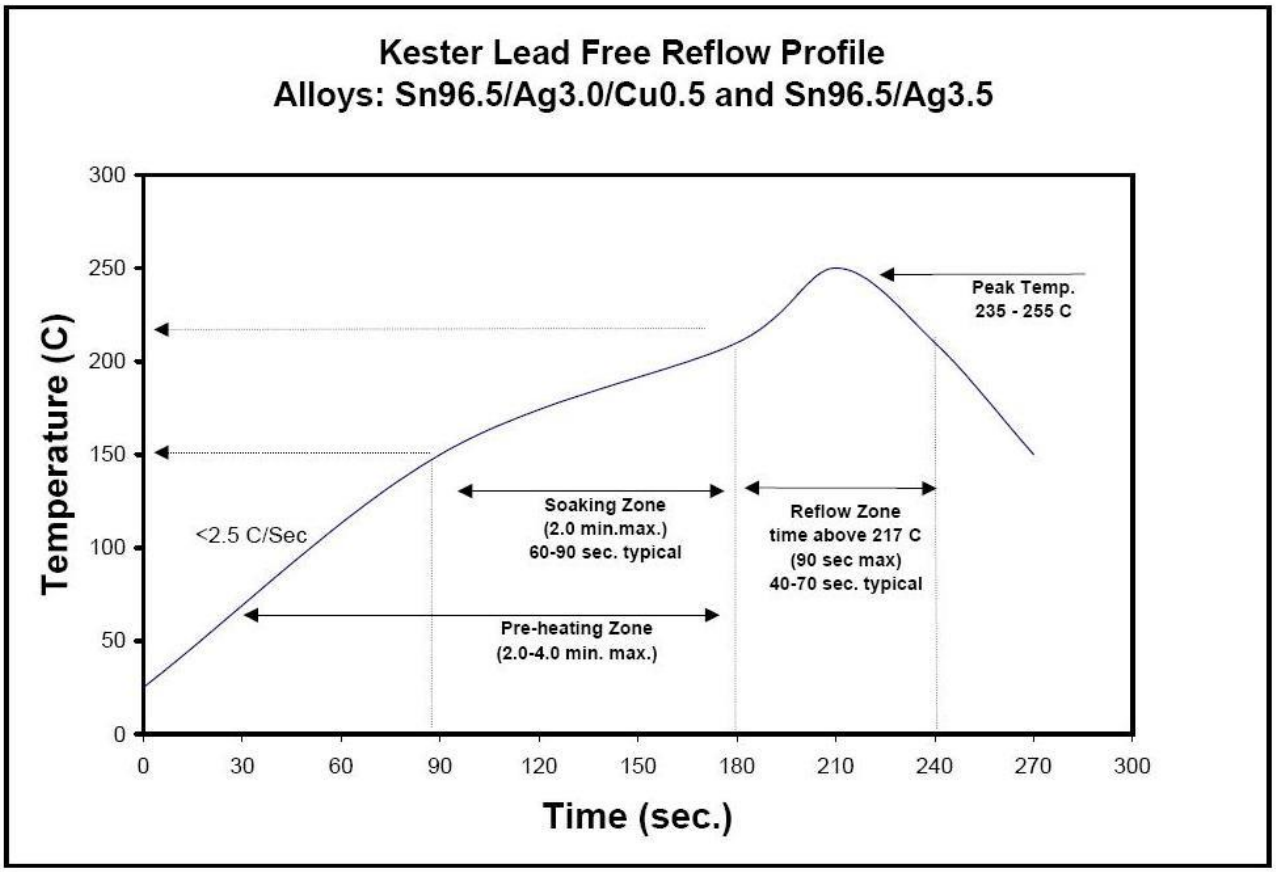
APPLICABLE DOCUMENTS

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 DWV/IR 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 DWV/IR 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) Re-Flow Time/Temp: See accompanying profile.
10) Samtec Test PCBs used: PCB-106210-TST.

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

IR/DWV

Pin-to-Pin

Group 1 S1SST-20-28-GF-06.00-S T1M-20-GF-S-V-TR 2 Assemblies		Group 2 S1SST-20-28-GF-06.00-S 2 Assemblies		Group 3 T1M-20-GF-S-V-TR 2 Assemblies		Group 4 S1SST-20-28-GF-06.00-S T1M-20-GF-S-V-TR 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

(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) DWV Breakdown = 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

(3) 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

(4) IR = EIA-364-21
Test Condition = 500 Vdc, 2 Minutes Max

(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)

FLOWCHARTS Continued

Current Carrying Capacity

Group 1
S1SST-20-28-GF-12.00-D-NUS
T1M-20-GF-S-V-TR
1 Pins Powered
Signal

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

Group 2
S1SST-20-28-GF-12.00-D-NUS
T1M-20-GF-S-V-TR
2 Pins Powered
Signal

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

Group 3
S1SST-20-28-GF-12.00-D-NUS
T1M-20-GF-S-V-TR
3 Pins Powered
Signal

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

Group 4
S1SST-20-28-GF-12.00-D-NUS
T1M-20-GF-S-V-TR
4 Pins Powered
Signal

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

Group 5
S1SST-20-28-GF-12.00-D-NUS
T1M-20-GF-S-V-TR
20 Pins Powered
Signal

Step	Description
1.	CCC (1) Rows = 1 Number of Positions = 20

(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 1: -55°C to +85°C
3) Test Time: ½ 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° C to + 65° 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 three temperature points are reported:
    a. Ambient
    b. 85^o C
    c. 95^o C
    d. 115^o 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

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 withstanding 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 withstanding 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 1 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise--------- 2.2 A per contact with 2 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise----------1.8 A per contact with 3 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise----------1.7 A per contact with 4 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise----------1.1 A per contact with 20 adjacent contacts 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----------18000 Meg Ω ---------- Passed**
  - **Unmated ----------22000 Meg Ω ---------- Passed**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage---------- 1133 VAC**
  - **Test Voltage ----------850 VAC**
  - **Working Voltage ----------280 VAC**

Pin to Pin

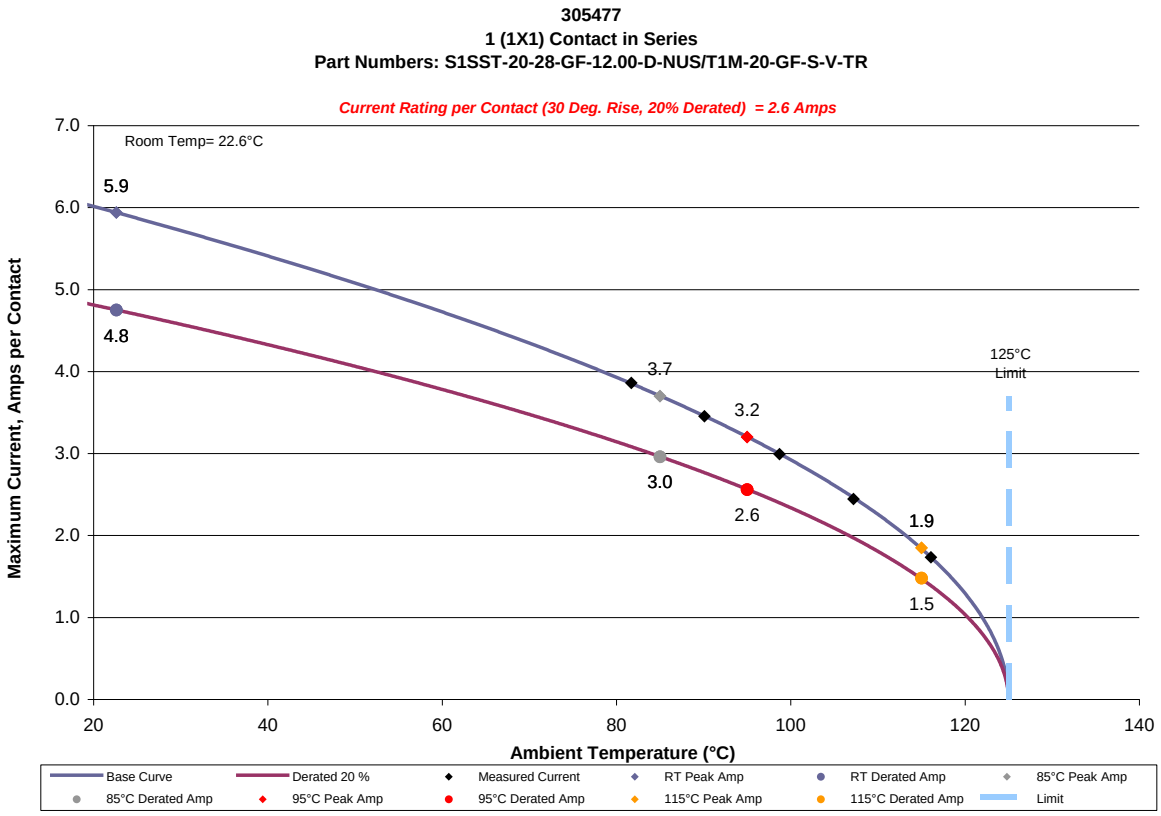
- **Initial DWV ----------Passed**
- **Thermal DWV----------Passed**
- **Humidity DWV----------Passed**

DATA SUMMARIES

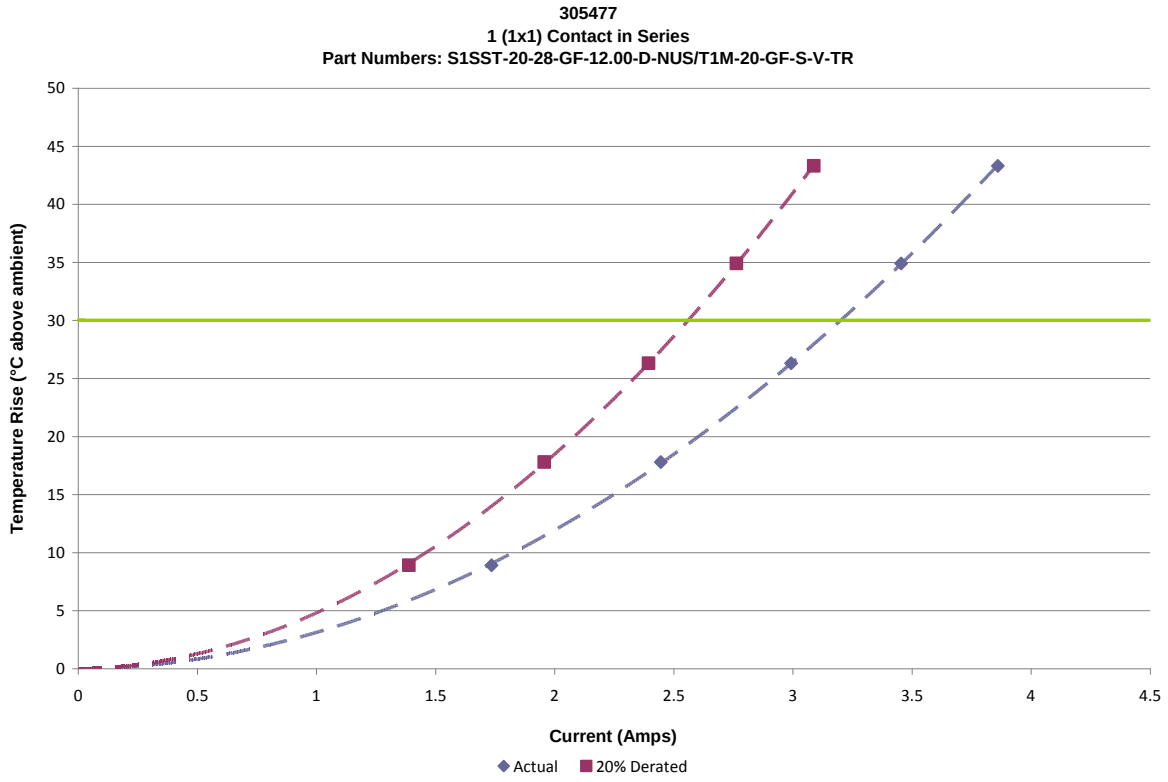
TEMPERATURE RISE (Current Carrying Capacity, CCC):

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 1 adjacent conductors/contacts powered

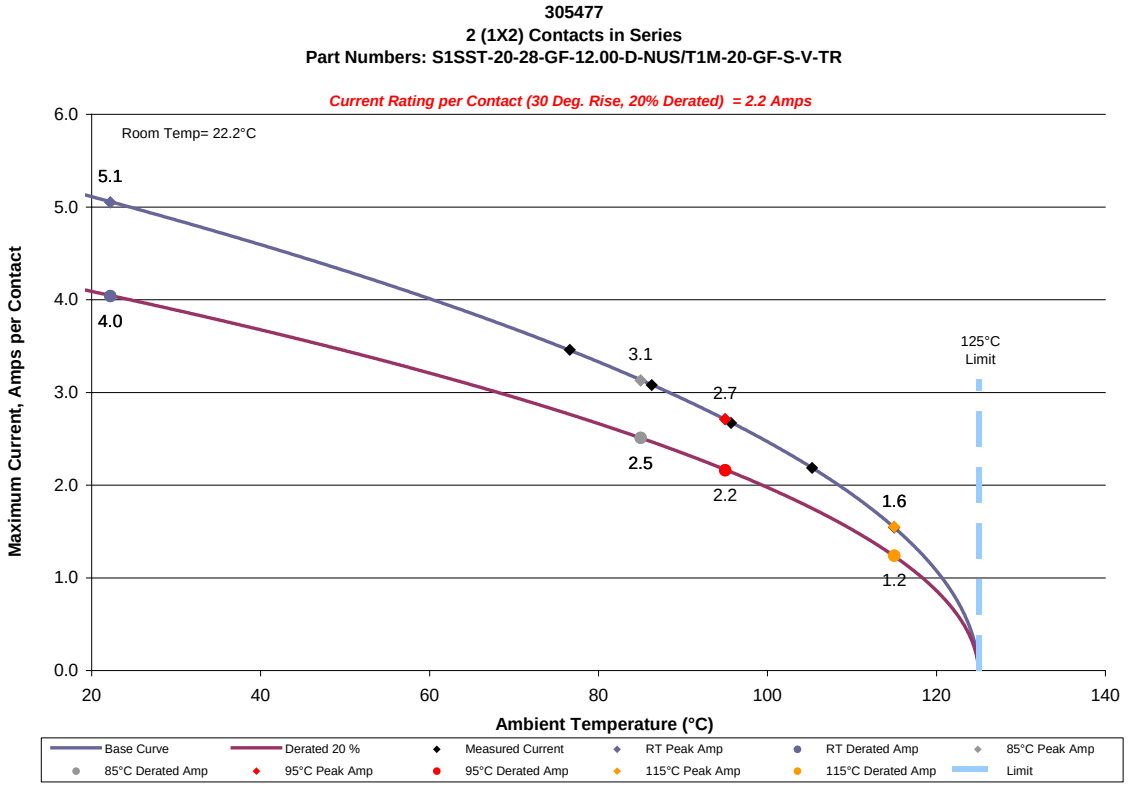


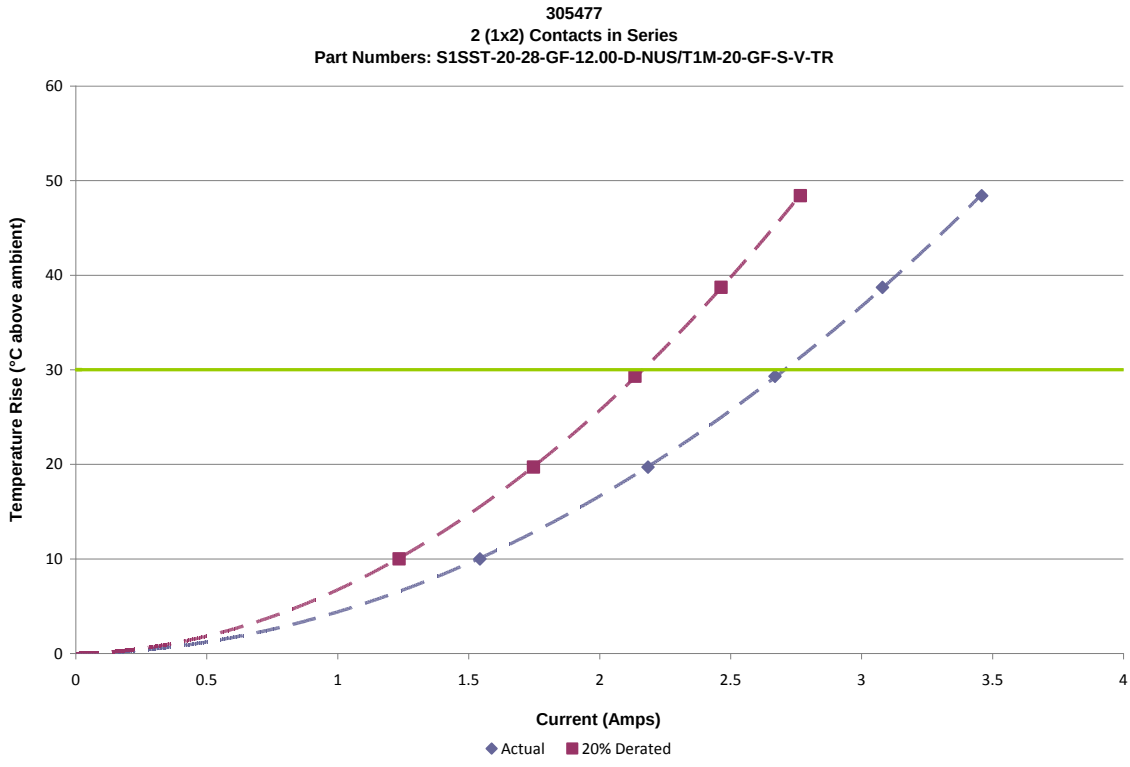
DATA SUMMARIES Continued



DATA SUMMARIES Continued

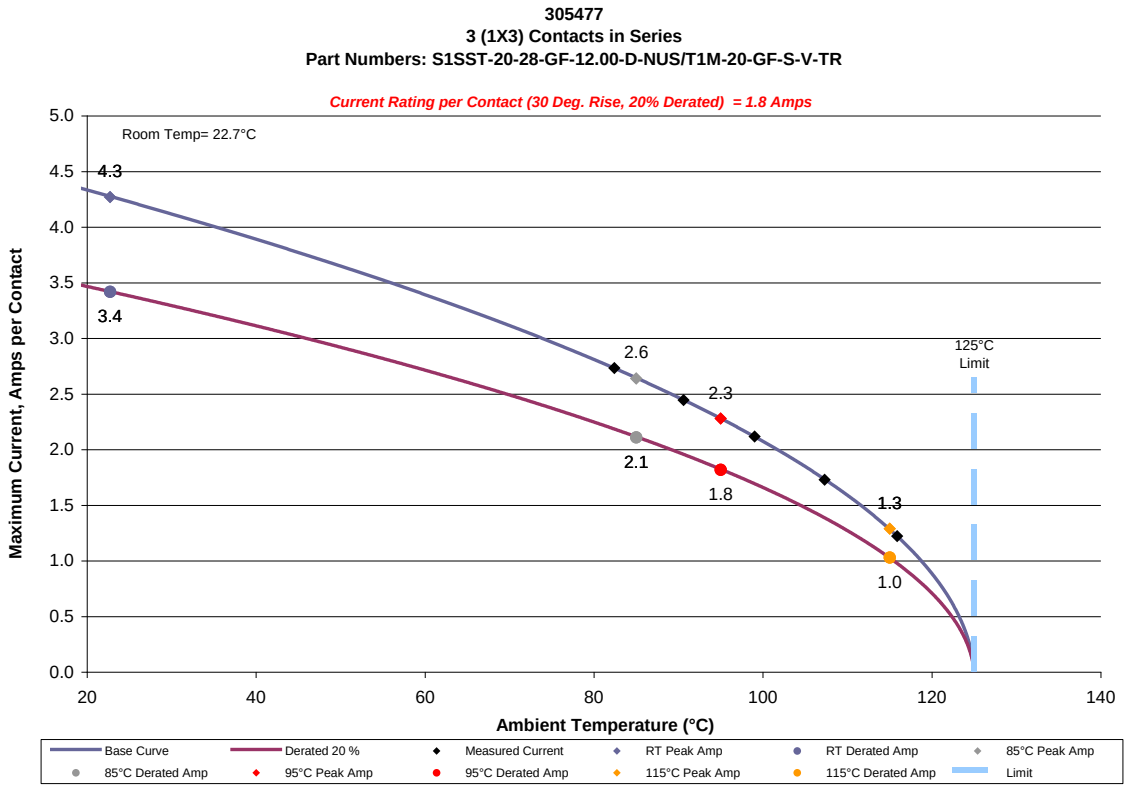
b. Linear configuration with 2 adjacent conductors/contacts powered

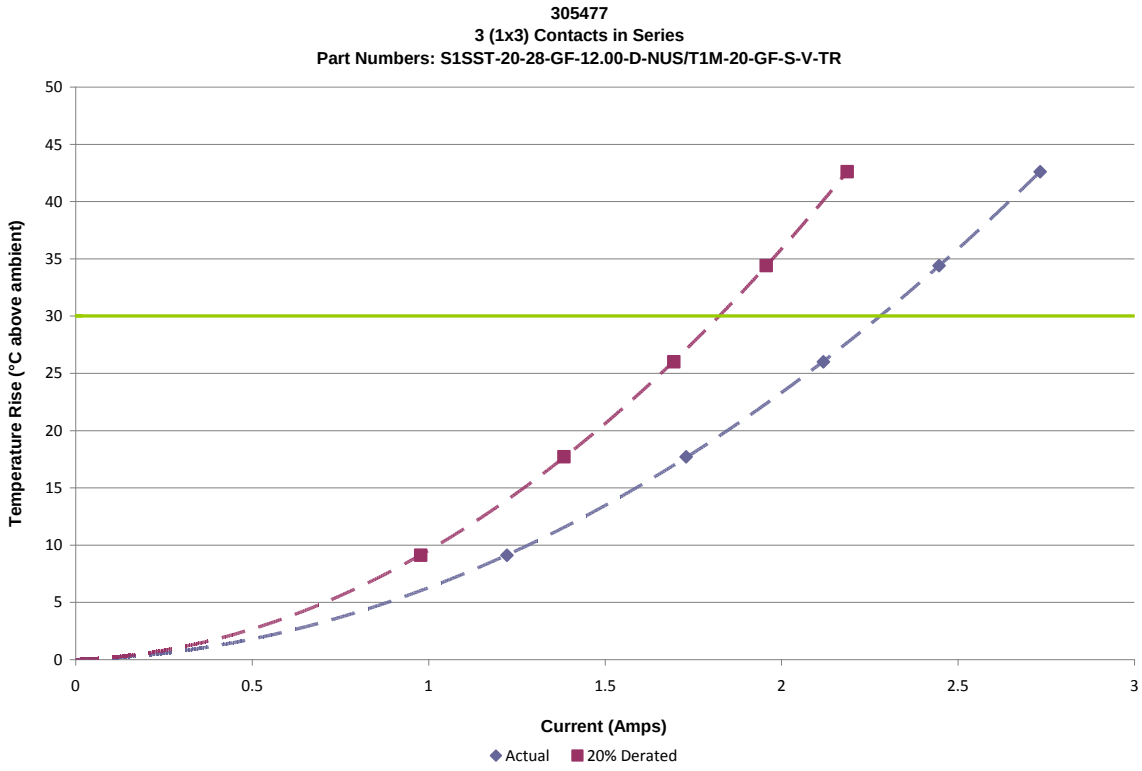




DATA SUMMARIES Continued

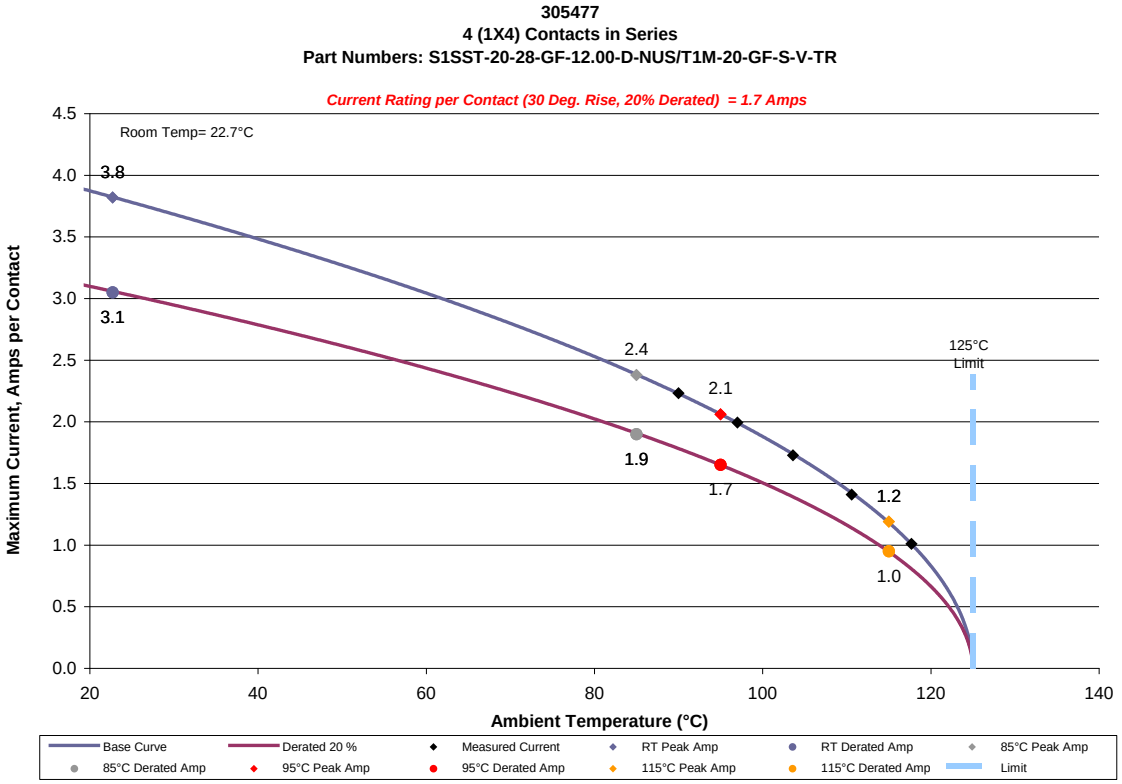
c. Linear configuration with 3 adjacent conductors/contacts powered

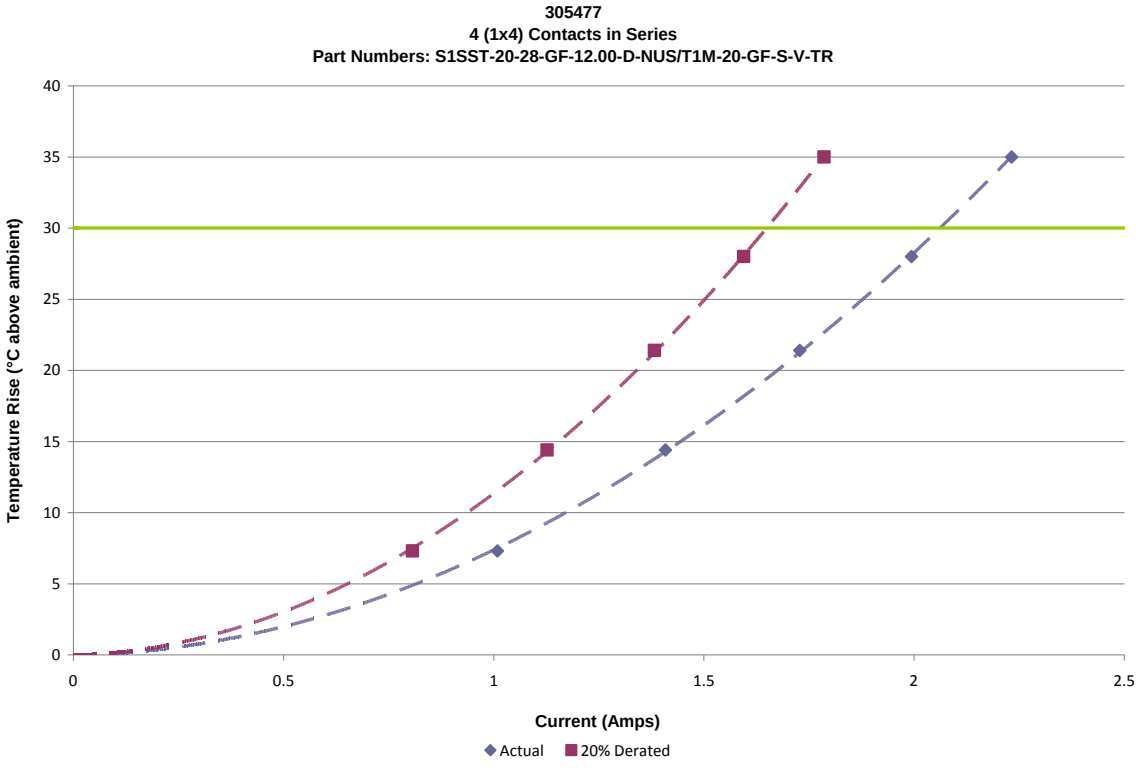




DATA SUMMARIES Continued

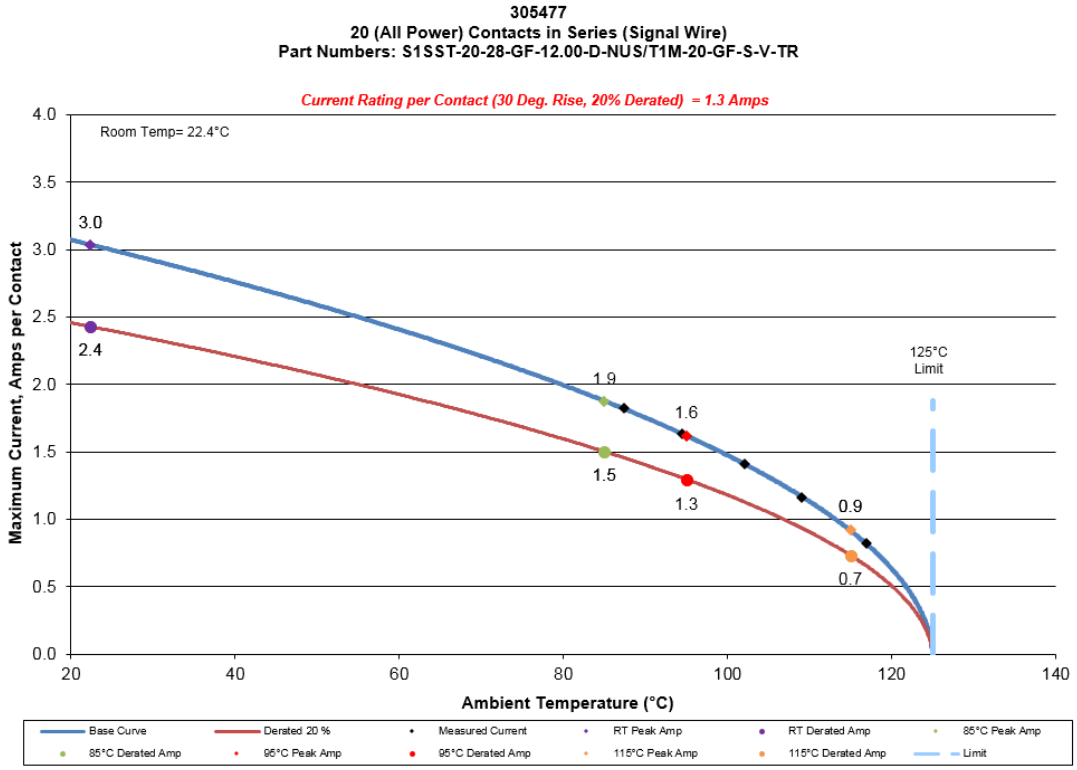
d. Linear configuration with 4 adjacent conductors/contacts powered

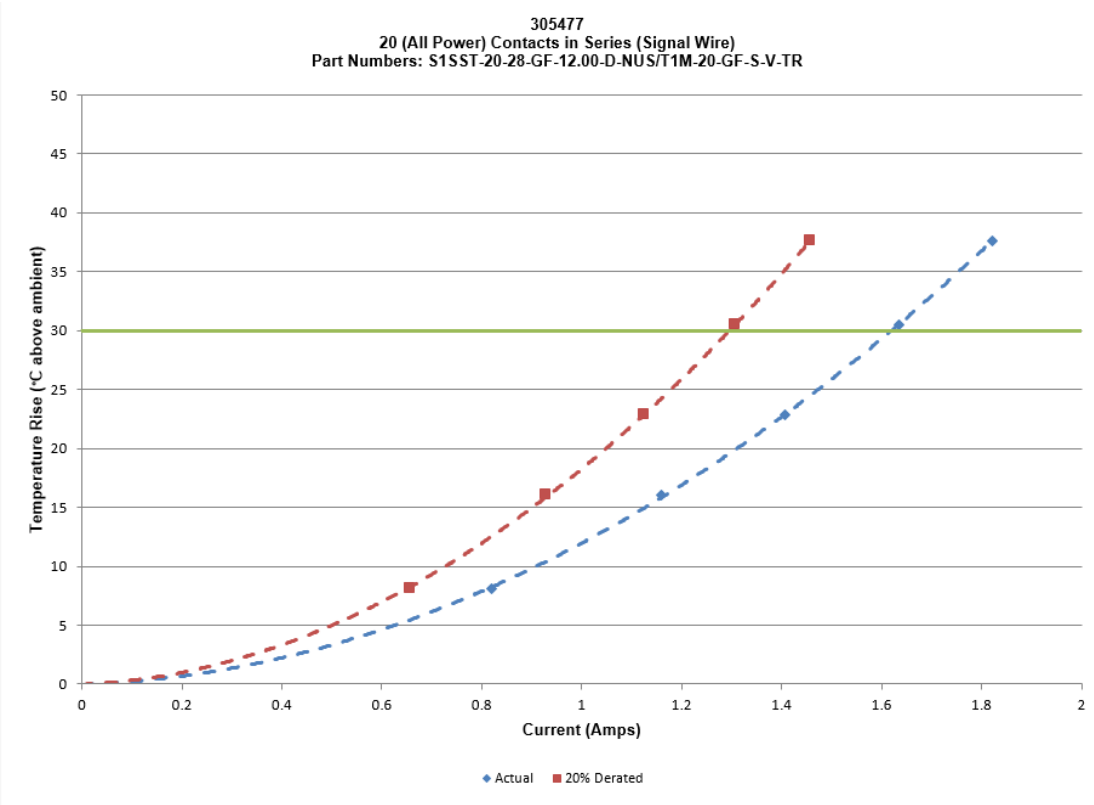




DATA SUMMARIES Continued

e. Linear configuration with all adjacent conductors/contacts powered





DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	**S1SST/T1M**	**S1SST**	**T1M**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	18000	45000	22000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**S1SST/T1M**
Break Down Voltage	1133
Test Voltage	850
Working Voltage	283

Pin to Pin	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THC-02
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SE-1000-6-6
Serial #: 31808
Accuracy: See Manual
… Last Cal: 02/16/2014, Next Cal: 02/16/2015

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnatti Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
… Last Cal: 05/18/2013, Next Cal: 05/18/2014

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 05/24/2013, Next Cal: 08/24/2014

Equipment #: PS-01
Description: Power Supply
Manufacturer: Agilent
Model: AT-6032A
Serial #: MY41001186
Accuracy: Last Cal: 06/12/2013, Next Cal: 046/12/2014

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 03/27/2014, Next Cal: 03/27/2015