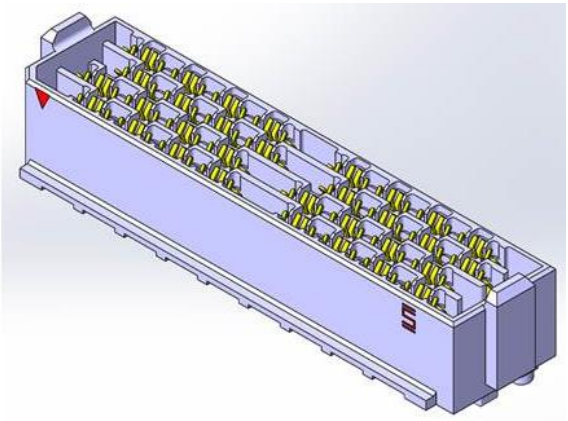
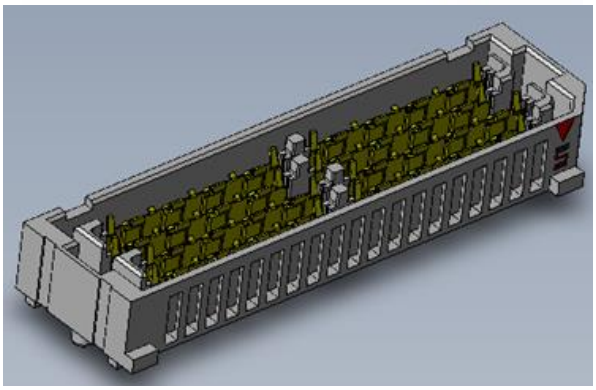
Project Number: Design Qualification Test Report	Tracking Code: 2623367_Report_Rev_1
Requested by: Jad Vicich	Date: 7/26/2021
Part #: NVAM-DP-04-2-05.0-S-2/NVAF-DP-04-2-05.0-S-2	
Part description: NVAM/NVAF	Tech: Peter Chen
Test Start: 1/20/2021	Test Completed: 3/1/2021





DESIGN QUALIFICATION TEST REPORT

NVAM/NVAF
NVAM-DP-04-2-05.0-S-2/NVAF-DP-04-2-05.0-S-2

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
7/12/2021	**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 LLCR and 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 LLCR and 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) Samtec Test PCBs used: PCB-108592-TST/PCB-108593-TST/PCB-110462-TST

FLOWCHARTS

Mating/Unmating/Durability

Group 1
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
8 Assemblies

Step	Description
1.	Contact Gaps
2.	LLCR (2)
3.	Mating/Unmating Force (3)
4.	Cycles Quantity = 25 Cycles
5.	Mating/Unmating Force (3)
6.	Contact Gaps
7.	LLCR (2) Max Delta = 15 mOhm
8.	Thermal Shock (4)
9.	LLCR (2) Max Delta = 15 mOhm
10.	Humidity (1)
11.	LLCR (2) Max Delta = 15 mOhm
12.	Mating/Unmating Force (3)

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

(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

Group 1
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
1 Pins Powered
Signal

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

Group 2
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
2 Pins Powered
Signal

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

Group 3
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
4 Pins Powered
Signal

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

Group 4
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
8 Pins Powered
Signal

Step	Description
1.	CCC (1) Rows = 1 Number of Positions = 8

Group 5
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
32 Pins Powered
Signal

Step	Description
1.	CCC (1) Rows = 4 Number of Positions = 8

Group 6
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
64 Pins Powered
Signal

Step	Description
1.	CCC (1) Rows = 8 Number of Positions = 8

Group 7
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
8 Pins Powered
Ground

Step	Description
1.	CCC (1) Rows = 1 Number of Positions = 8

Group 8
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
16 Pins Powered
Ground

Step	Description
1.	CCC (1) Rows = 2 Number of Positions = 8

Group 9
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
32 Pins Powered
Ground

Step	Description
1.	CCC (1) Rows = 4 Number of Positions = 8

Group 10
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
64 Pins Powered
Ground

Step	Description
1.	CCC (1) Rows = 4 Number of Positions = 16

Group 11
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
128
All Power

Step	Description
1.	CCC (1)

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(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

FLOWCHARTS Continued

Mechanical Shock/Random Vibration/LLCR

Group 1
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
8 Assemblies

Step	Description
1.	LLCR (1)
2.	Mechanical Shock (2)
3.	Random Vibration (3)
4.	LLCR (1) Max Delta = 15 mOhm

(1) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Mechanical Shock = EIA-364-27
Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(3) Random Vibration = EIA-364-28
Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

Mechanical Shock/Random Vibration/Event Detection

Group 1
NVAM-DP-04-2-05.0-S-2
NVAF-DP-04-2-05.0-S-2
60 Points

Step	Description
1.	Nanosecond Event Detection (Mechanical Shock) (1)
2.	Nanosecond Event Detection (Random Vibration) (2)

(1) Nanosecond Event Detection (Mechanical Shock)
Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)
Use EIA-364-27 for Mechanical Shock:
Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(2) Nanosecond Event Detection (Random Vibration)
Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)
Use EIA-364-28 for Random Vibration:
Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

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.

MECHANICAL SHOCK (Specified Pulse):

1) Reference document: EIA-364-27, *Mechanical Shock Test Procedure for Electrical Connectors*
2) Test Condition C
3) Peak Value: 100 G
4) Duration: 6 Milliseconds
5) Wave Form: Half Sine
6) Velocity: 12.3 ft/s
7) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:

1) Reference document: EIA-364-28, *Vibration Test Procedure for Electrical Connectors*
2) Test Condition V, Letter B
3) Power Spectral Density: 0.04 G^2 / Hz
4) G 'RMS': 7.56
5) Frequency: 50 to 2000 Hz
6) Duration: 2.0 Hours per axis (3 axis total)

NANOSECOND-EVENT DETECTION:

1) Reference document: EIA-364-87, *Nanosecond-Event Detection for Electrical Connectors*
2) Prior to test, the samples were characterized to assure the low nanosecond event being monitored will trigger the detector.
3) After characterization it was determined the test samples could be monitored for 50 nanosecond events

ATTRIBUTE DEFINITIONS Continued

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^{o} C
    c. 95^{o} C
    d. 115^{o} 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.

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. <= +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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
2) The contacts shall be tested in the loose state, *not* inserted in connector housing.
3) The contacts shall be prepared to allow access to the spring member at the same attitude and deflection level as would occur in actual use.
4) In the event that portions of the contact prevent insertion of the test probe and/or deflection of the spring member under evaluation, said material shall be removed leaving the appropriate contact surfaces exposed.
5) In the case of multi-tine contacts, each tine shall be tested independently on separate samples as required.
6) The connector housing shall be simulated, if required, in order to provide an accurate representation of the actual contact system performance.
7) A holding fixture shall be fashioned to allow the contact to be properly deflected.
8) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC^2, computer controlled test stand with a deflection measurement system accuracy of 5 µm (0.0002”).
9) The probe shall be attached to a Dillon P/N 49761-0105, 5 N (1.1 Lb) load cell providing an accuracy of ± 0.2%.
10) The nominal deflection rate shall be 5 mm (0.2”)/minute.
11) Unless otherwise noted a minimum of five contacts shall be tested.
12) The force/deflection characteristic to load and unload each contact shall be repeated five times.
13) The system shall utilize the TC^2 software in order to acquire and record the test data.
14) The permanent set of each contact shall be measured within the TC^2 software.
15) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a print out will be stored with the Tracking Code paperwork.

RESULTS

Temperature Rise, CCC at a 20% de-rating

Signal Pin

- **CCC for a 30°C Temperature Rise----------1.9 A per contact with 1 contact (1x1) powered**
- **CCC for a 30°C Temperature Rise----------1.4 A per contact with 2 contacts (1x2) powered**
- **CCC for a 30°C Temperature Rise----------1.2 A per contact with 4 contacts (1x4) powered**
- **CCC for a 30°C Temperature Rise----------1.0 A per contact with 8 contacts (1x8) powered**
- **CCC for a 30°C Temperature Rise----------0.6 A per contact with 32 contacts (4x8) powered**
- **CCC for a 30°C Temperature Rise----------0.5 A per contact with 64 contacts (8x8) powered**

Ground Pin

- **CCC for a 30°C Temperature Rise----------10.2 A per contact with 8 contact (1x8) powered**
- **CCC for a 30°C Temperature Rise----------8.7 A per contact with 16 contacts (2x8) powered**
- **CCC for a 30°C Temperature Rise----------7.0 A per contact with 32 contacts (4x8) powered**
- **CCC for a 30°C Temperature Rise----------5.6 A per contact with 64 contacts (4x16) powered**

Ground pin and Signal pin

- **CCC for a 30°C Temperature Rise----------5.3 A per contact with all adjacent ground contacts powered and signal contacts powered @ 1/2 rated current.**

Mating – Unmating Forces

Mating-Unmating Durability Group

- **Initial**
  - **Mating**
    - **Min ----------11.53 Lbs**
    - **Max----------19.00 Lbs**
  - **Unmating**
    - **Min ---------- 7.96 Lbs**
    - **Max----------10.28 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------13.80 Lbs**
    - **Max----------20.07 Lbs**
  - **Unmating**
    - **Min ---------- 8.07 Lbs**
    - **Max----------12.57 Lbs**
- **Humidity**
  - **Mating**
    - **Min ---------- 8.73 Lbs**
    - **Max----------12.93 Lbs**
  - **Unmating**
    - **Min ---------- 5.33 Lbs**
    - **Max---------- 7.80 Lbs**

RESULTS Continued

LLCR Mating/Unmating Durability Group (128 signal and 64 ground LLCR test points)

Signal Pin

- **Initial ---------- 34.84 mOhms Max**
- **Durability, 25 Cycles**
  - **<= +5.0 mOhms ---------- 128 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 Shock**
  - **<= +5.0 mOhms ---------- 128 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 ---------- 128 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**

Ground Pin

- **Initial ---------- 0.49 mOhms Max**
- **Durability, 25 Cycles**
  - **<= +5.0 mOhms ---------- 64 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 Shock**
  - **<= +5.0 mOhms ---------- 64 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 ---------- 64 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

LLCR Shock & Vibration Group (128 signal and 64 ground LLCR test points)

Signal Pin

- **Initial ---------- 36.84 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms----------128 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**

Ground Pin

- **Initial ----------0.34 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms---------- 64 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**

Mechanical Shock & Random Vibration:

- **Shock**
  - **No Damage---------- ---------- Passed**
  - **50 Nanoseconds ---------- ---------- Passed**
- **Vibration**
  - **No Damage---------- ---------- Passed**
  - **50 Nanoseconds ---------- ---------- Passed**

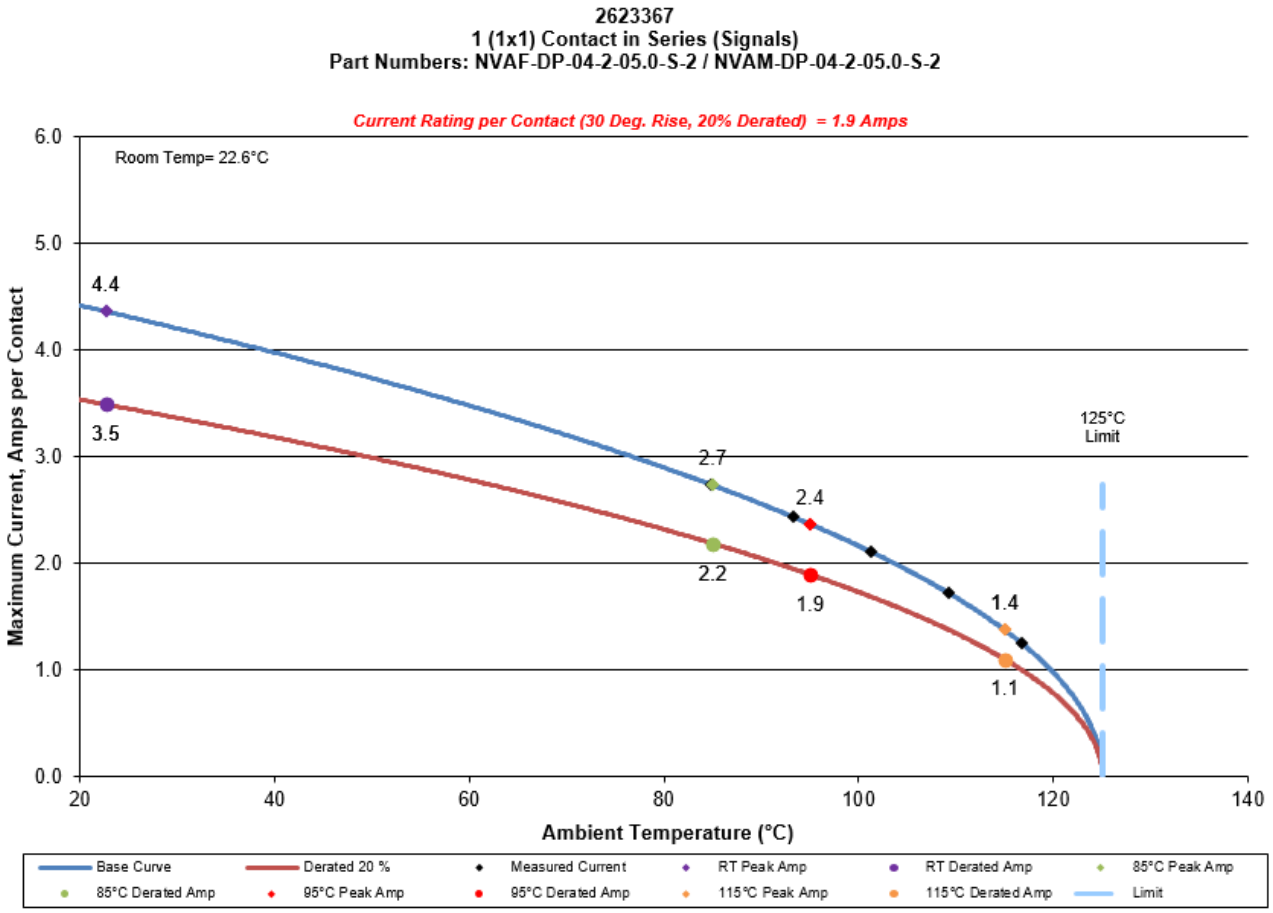
DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

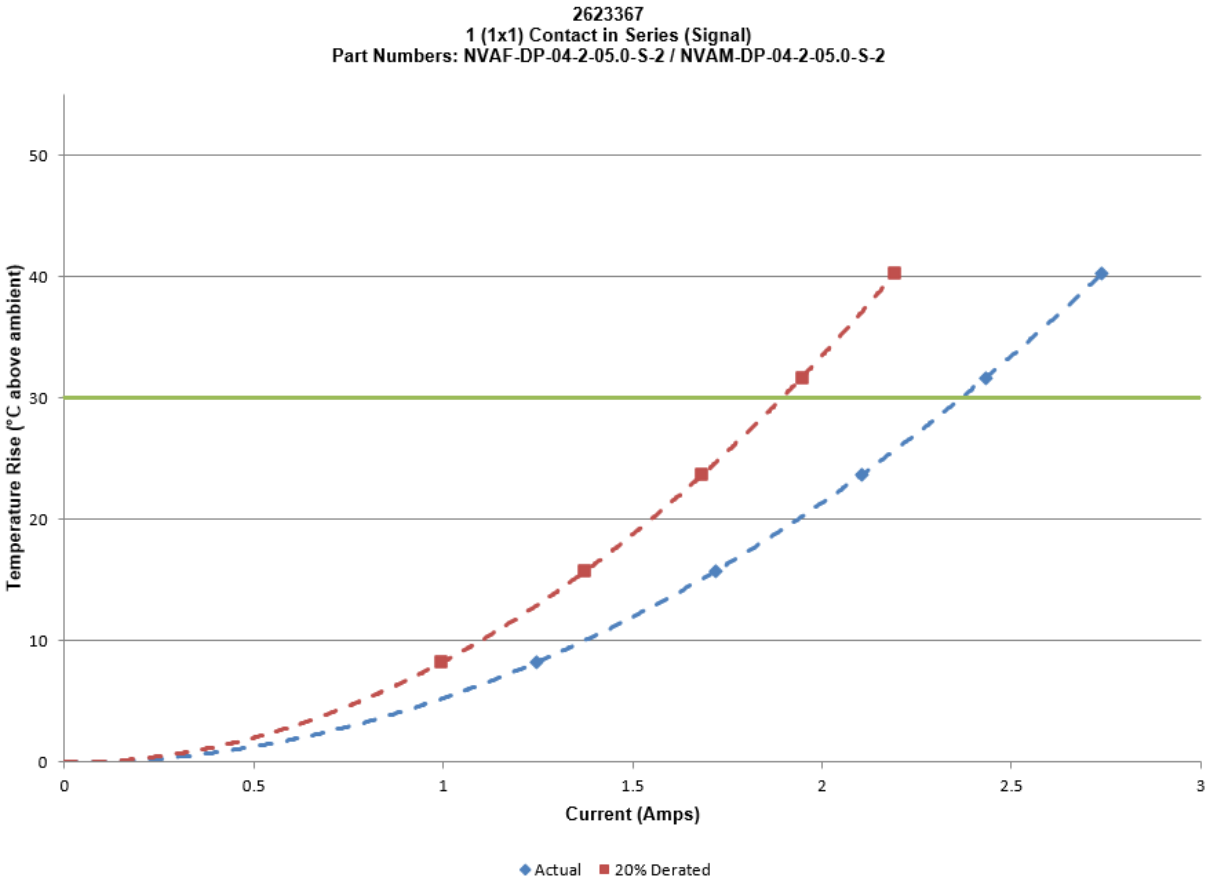
1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes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

Signal Pin

a. Linear configuration with 1 adjacent conductors/contacts powered

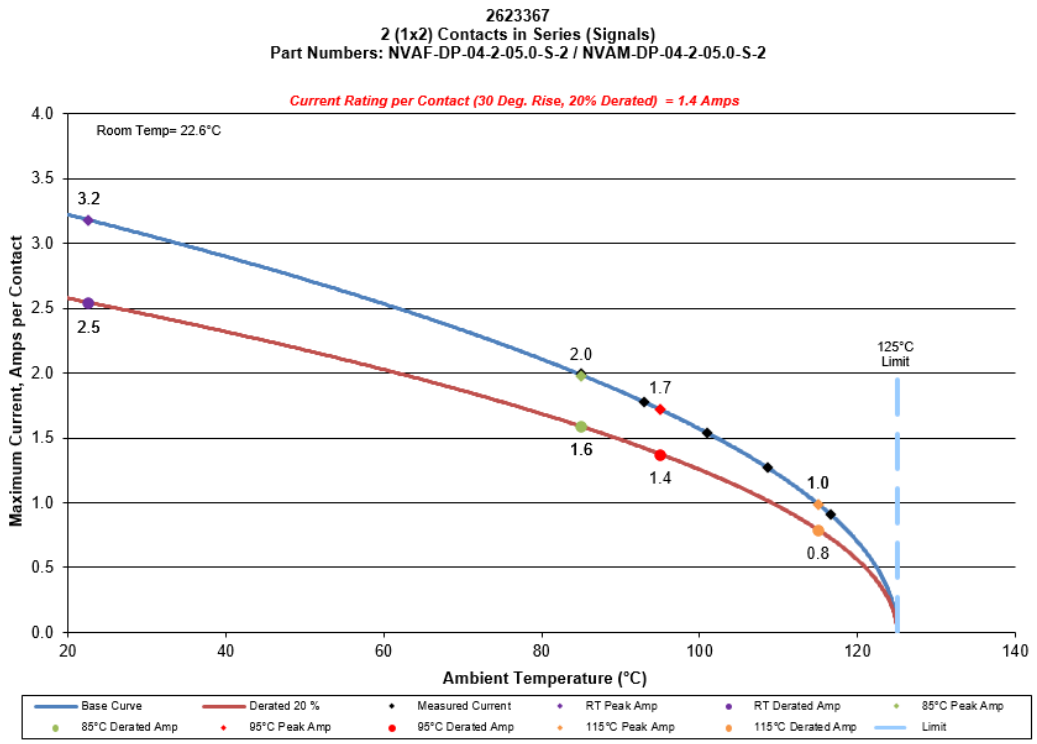


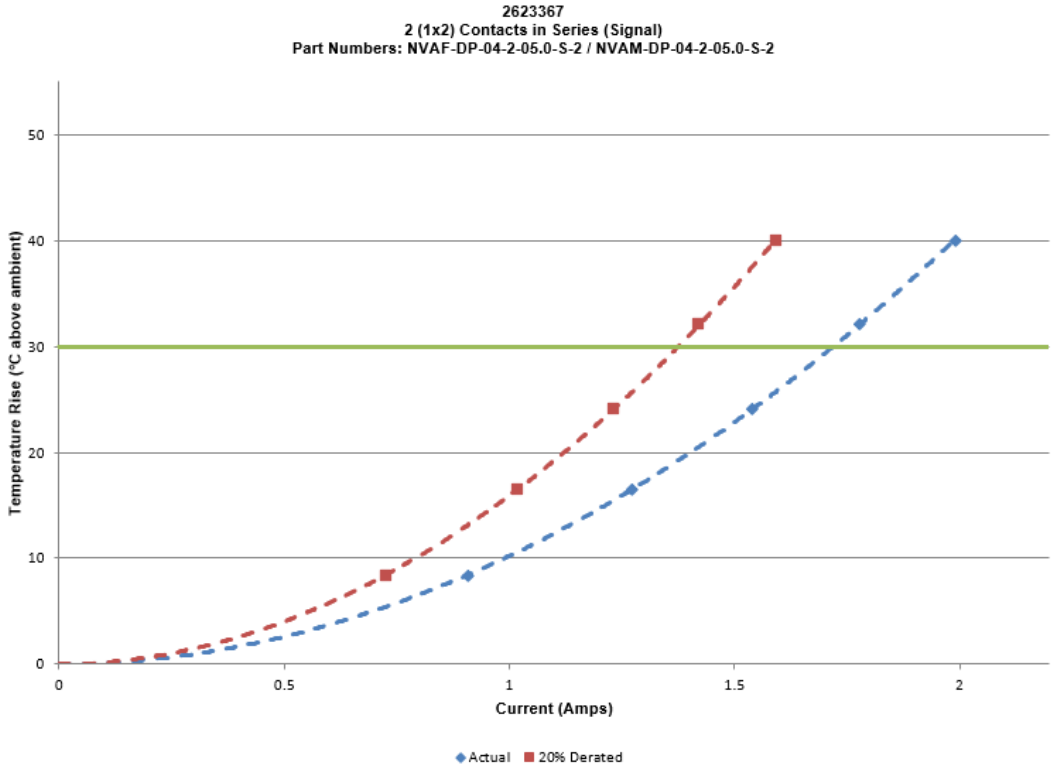
DATA SUMMARIES Continued



DATA SUMMARIES Continued

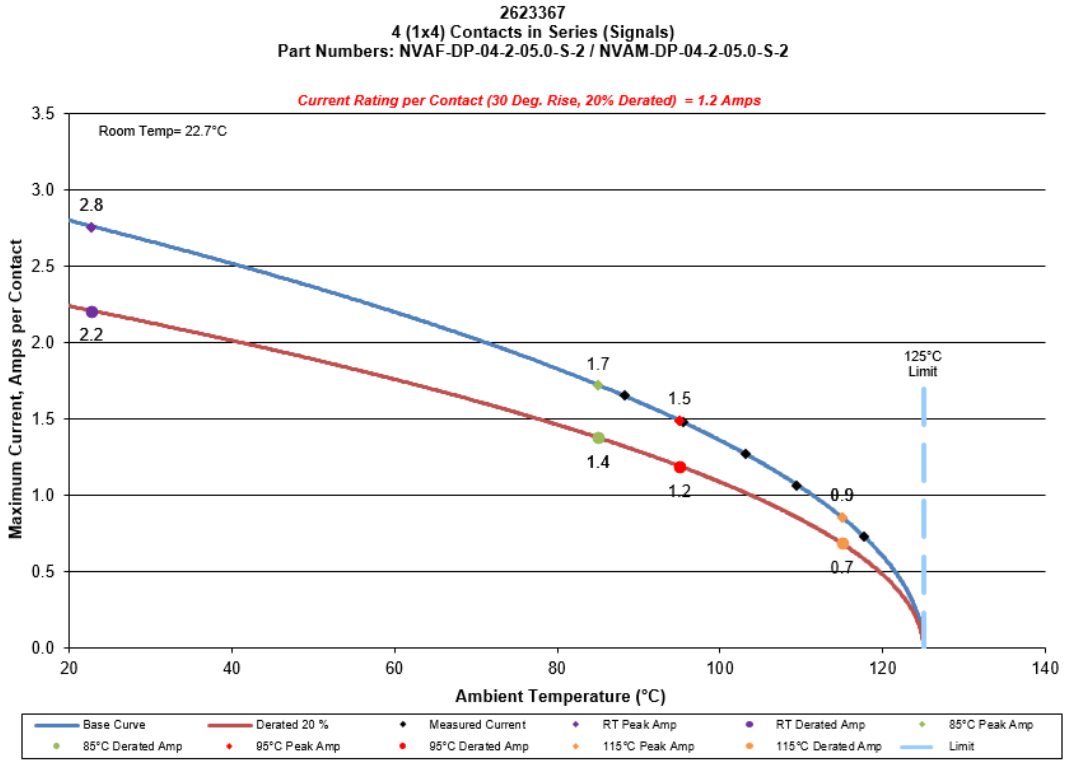
b. Linear configuration with 2 adjacent conductors/contacts powered

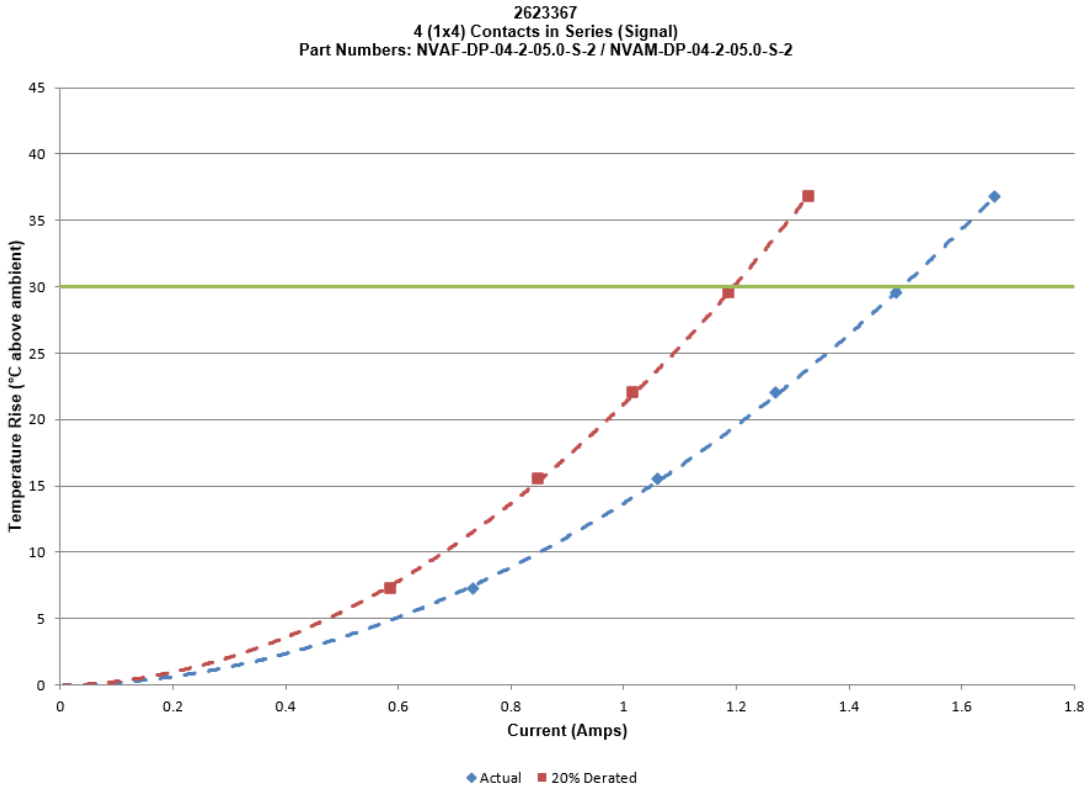




DATA SUMMARIES Continued

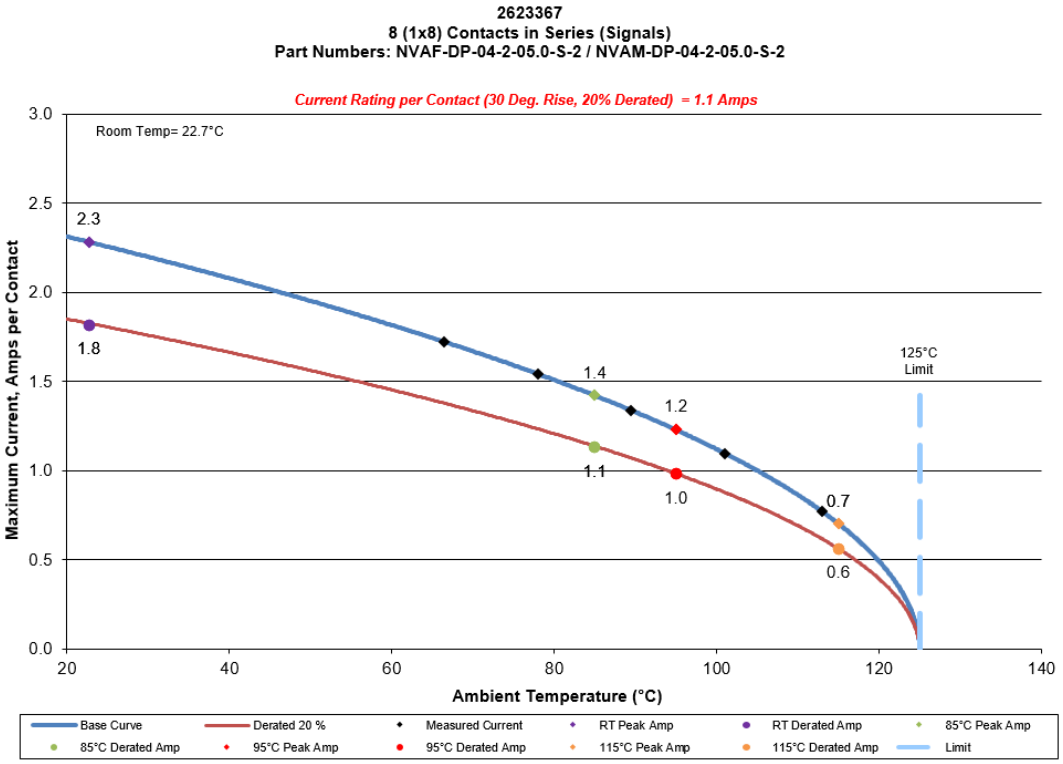
c. Linear configuration with 4 adjacent conductors/contacts powered

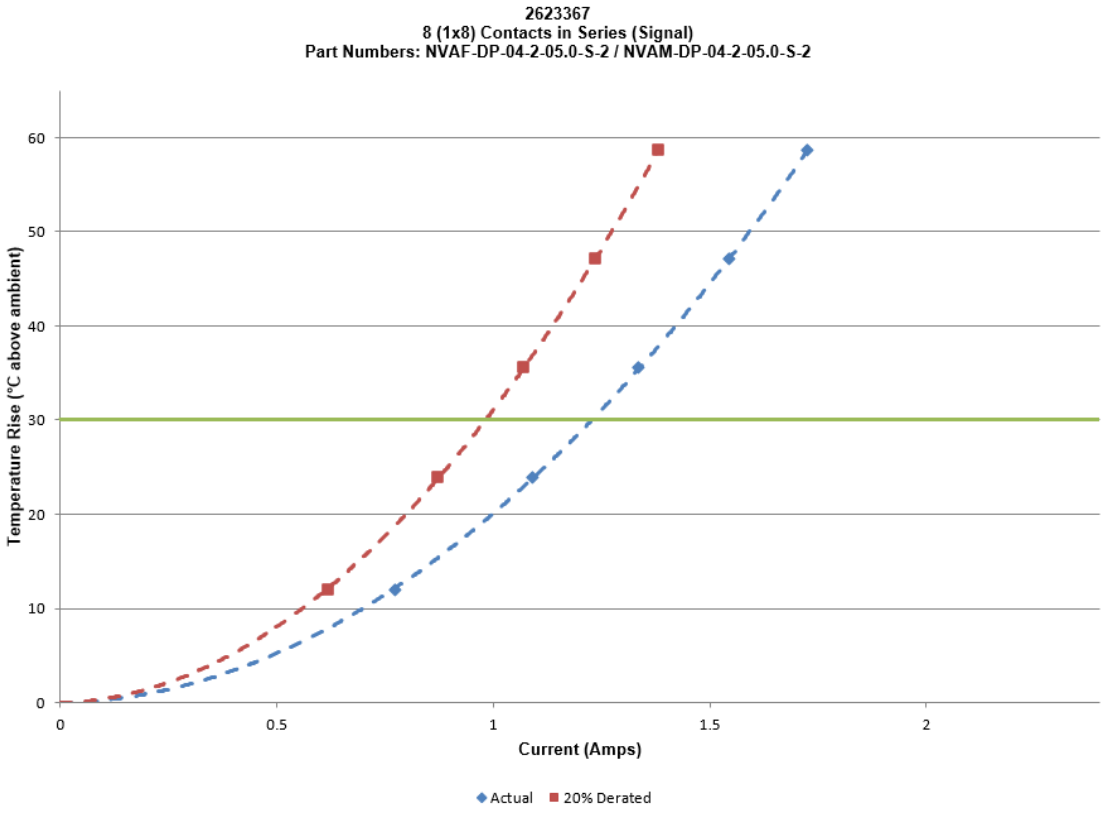




DATA SUMMARIES Continued

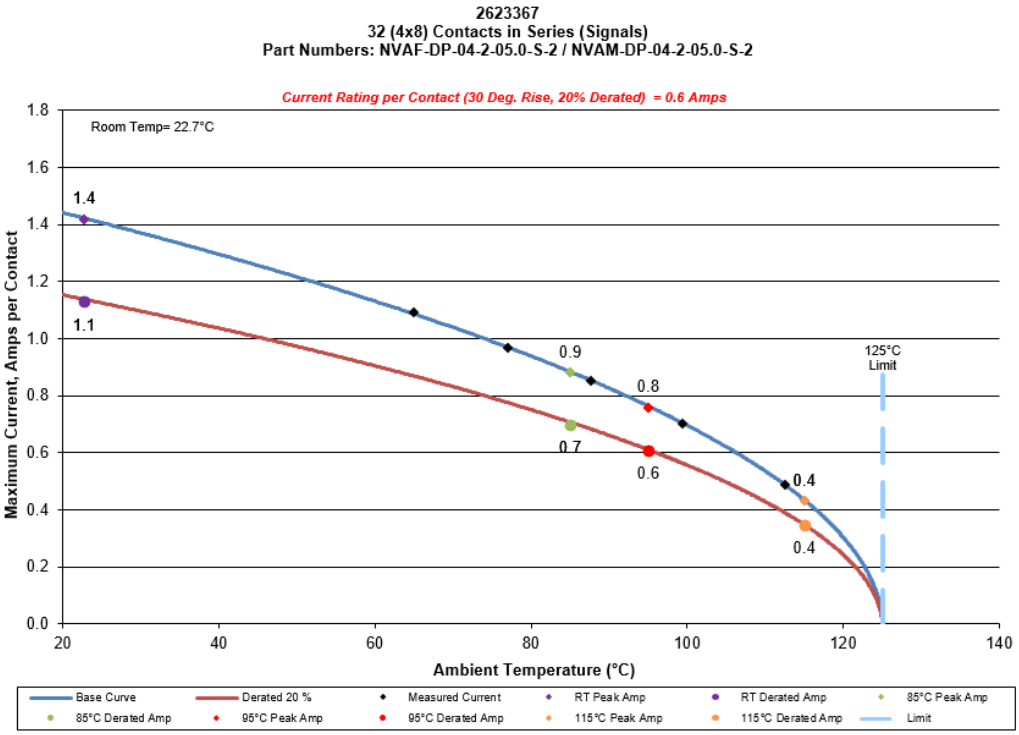
d. Linear configuration with 8 adjacent conductors/contacts powered

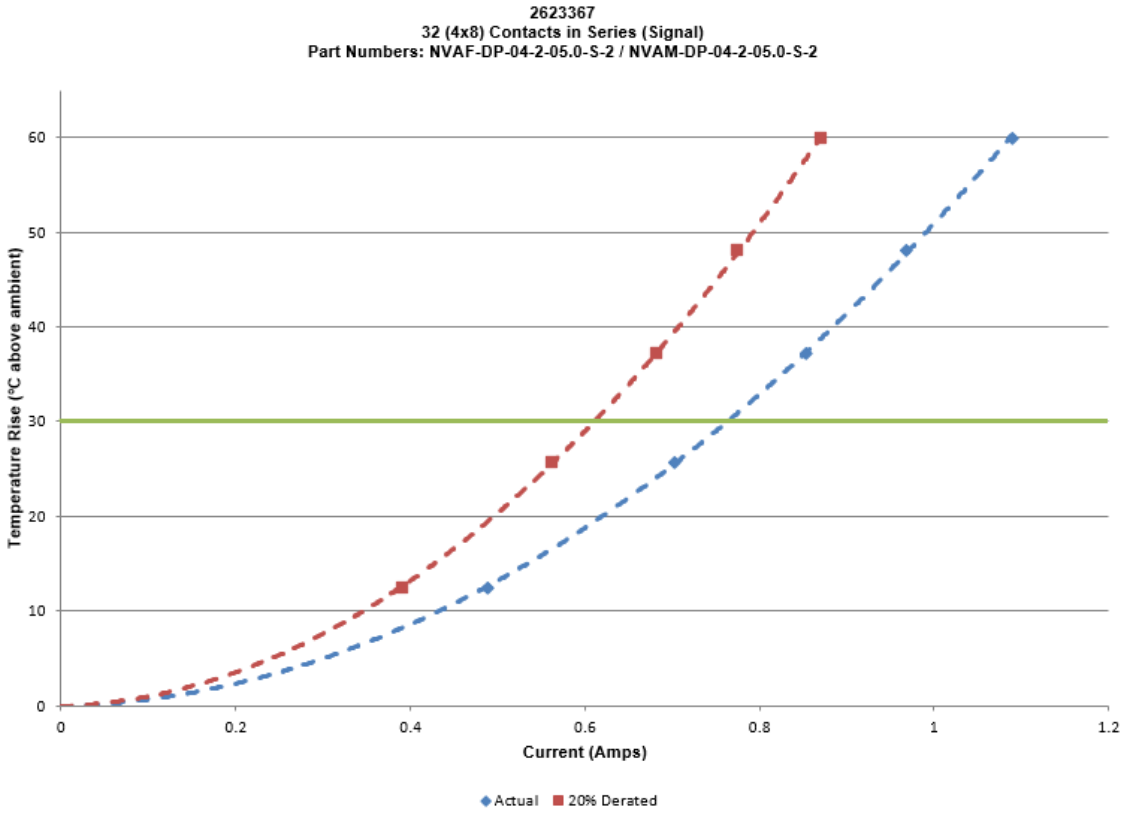




DATA SUMMARIES Continued

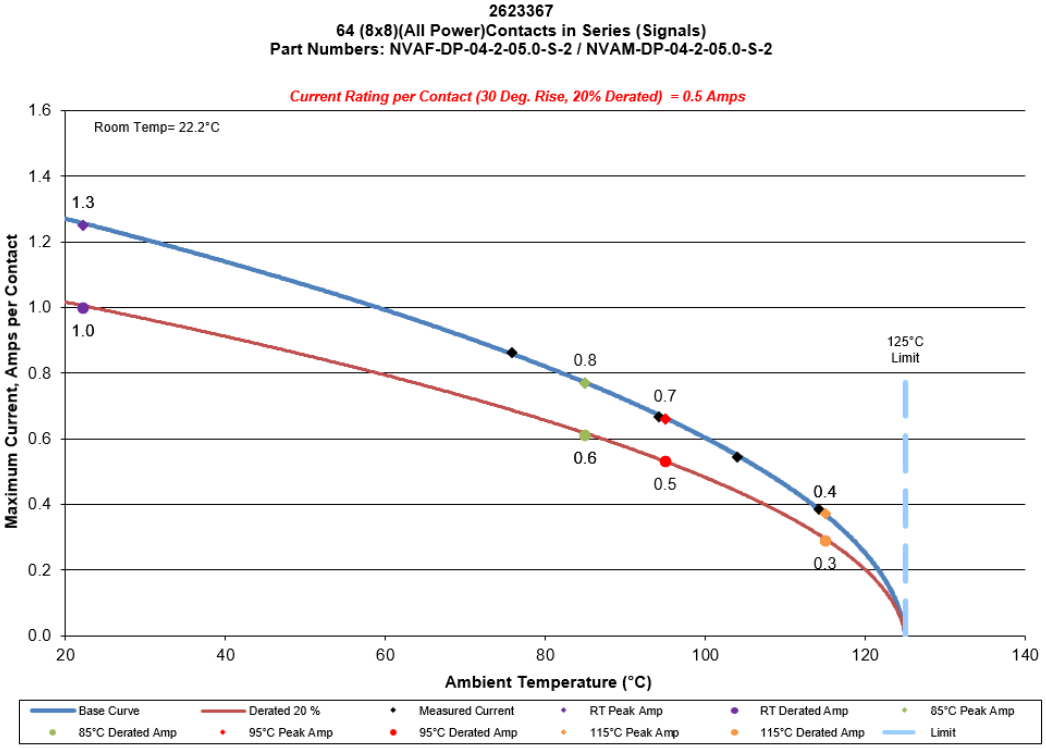
e. Linear configuration with 32 adjacent conductors/contacts powered

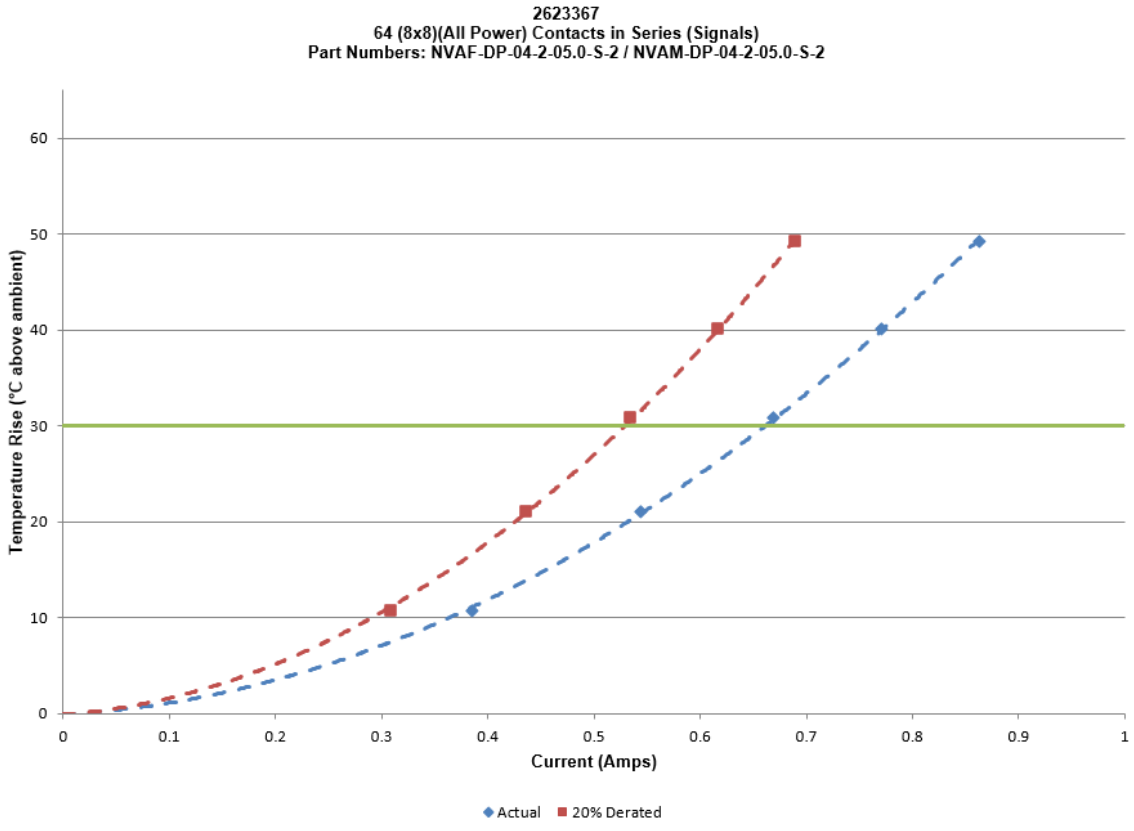




DATA SUMMARIES Continued

f. Linear configuration with all adjacent conductors/contacts powered

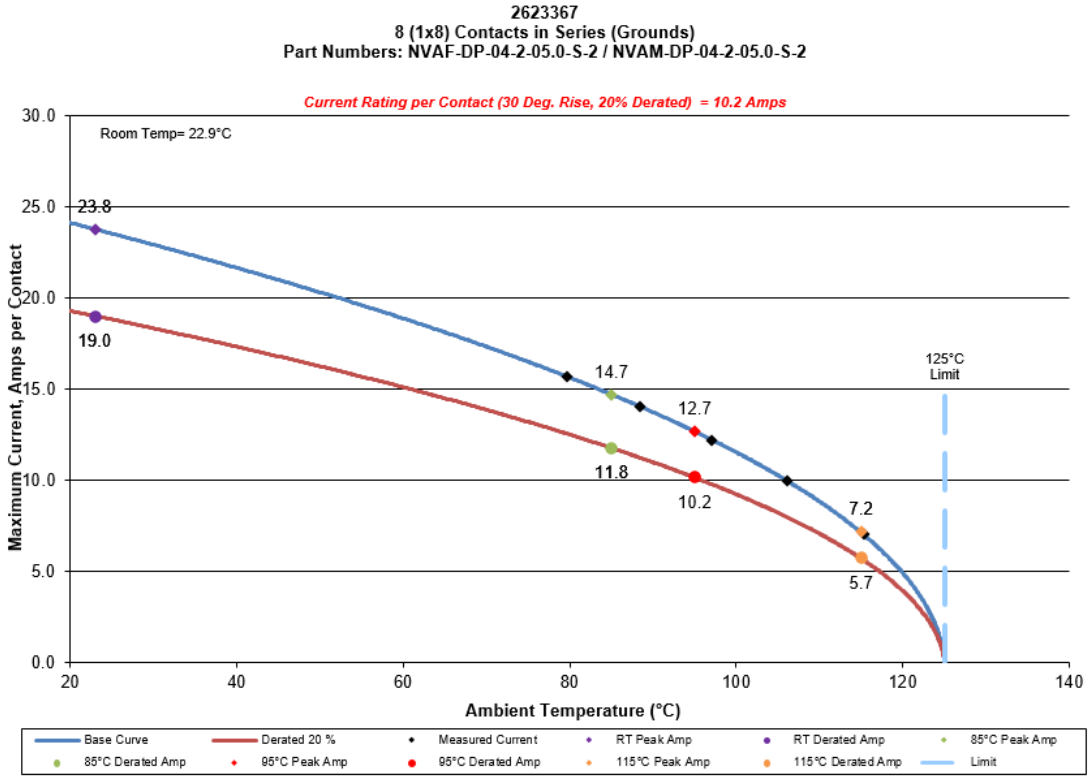


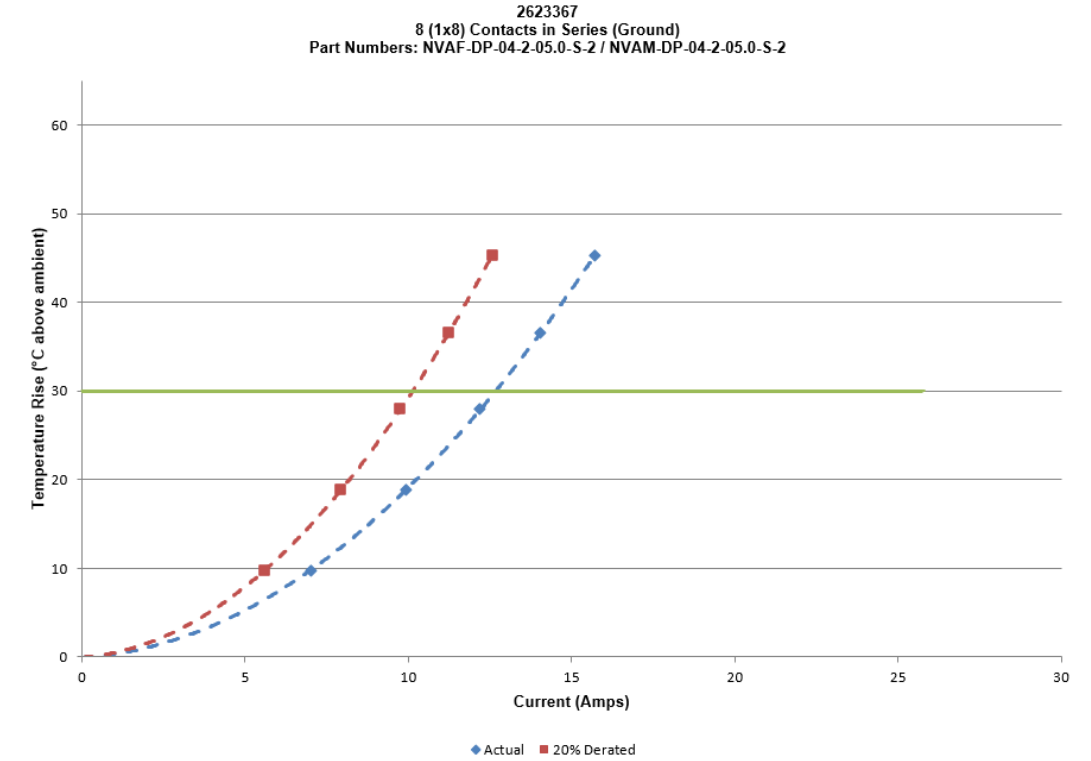


DATA SUMMARIES Continued

Group Pin

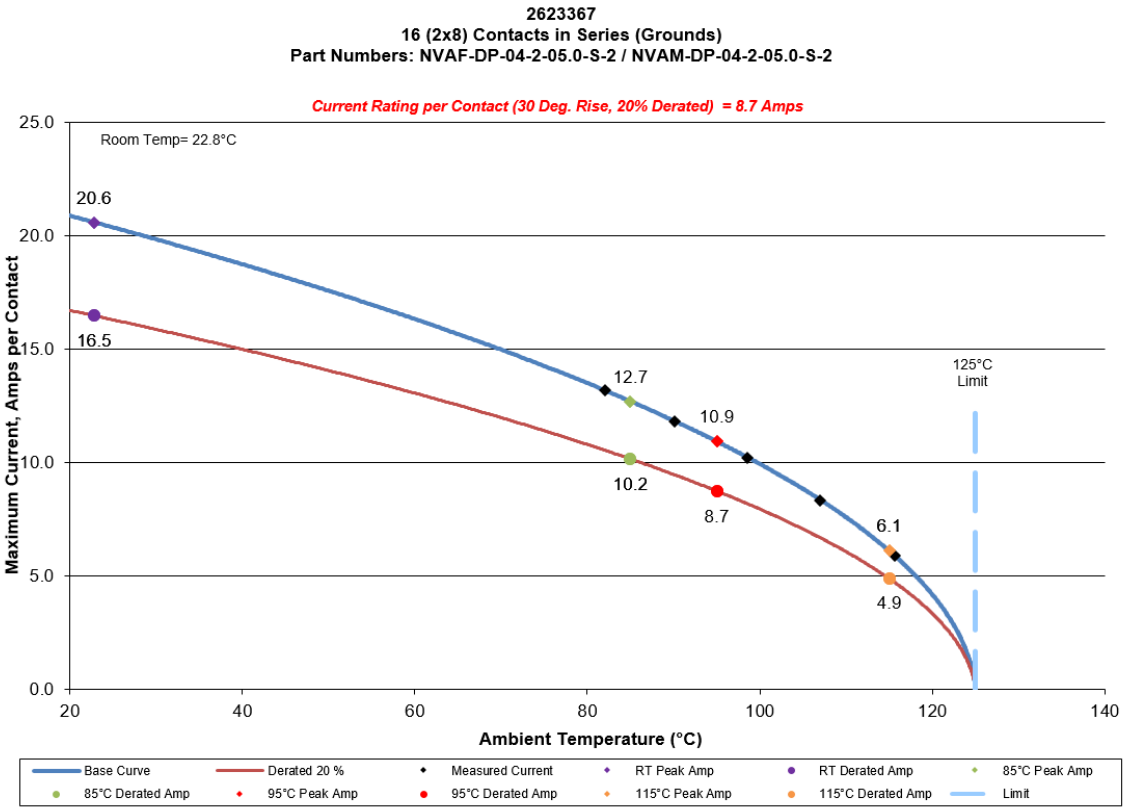
g. Linear configuration with 8 adjacent conductors/contacts powered

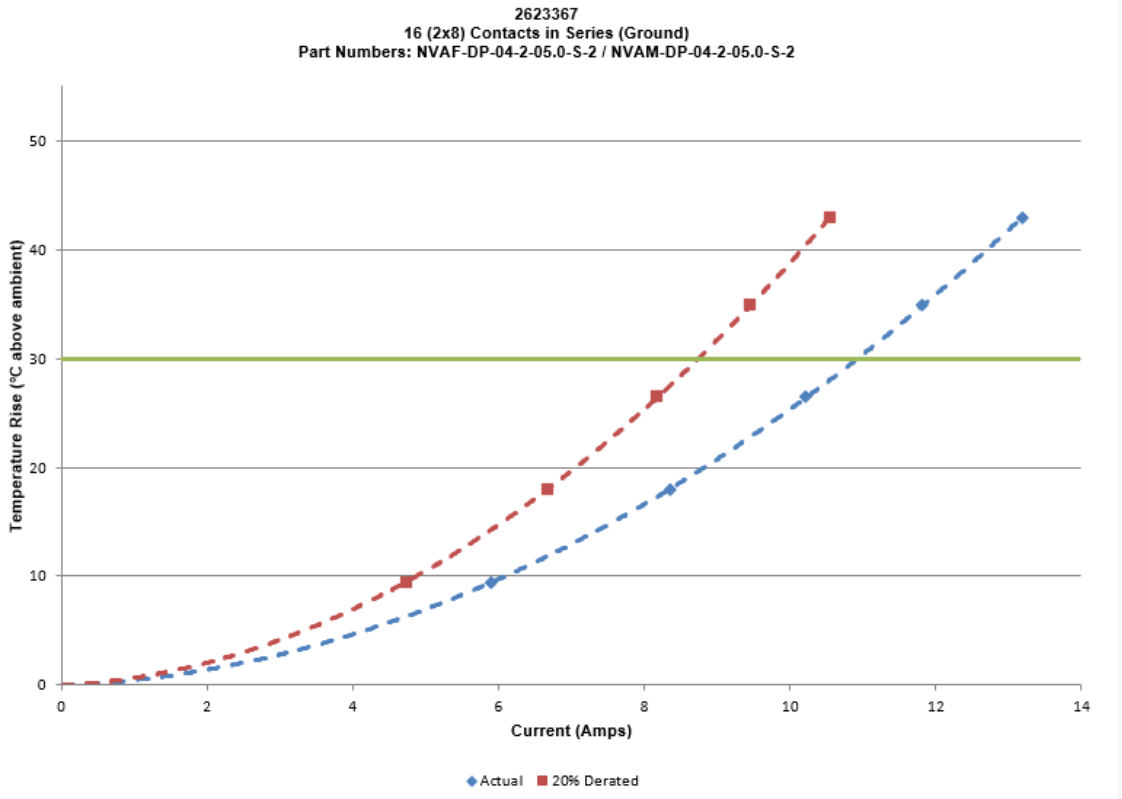




DATA SUMMARIES Continued

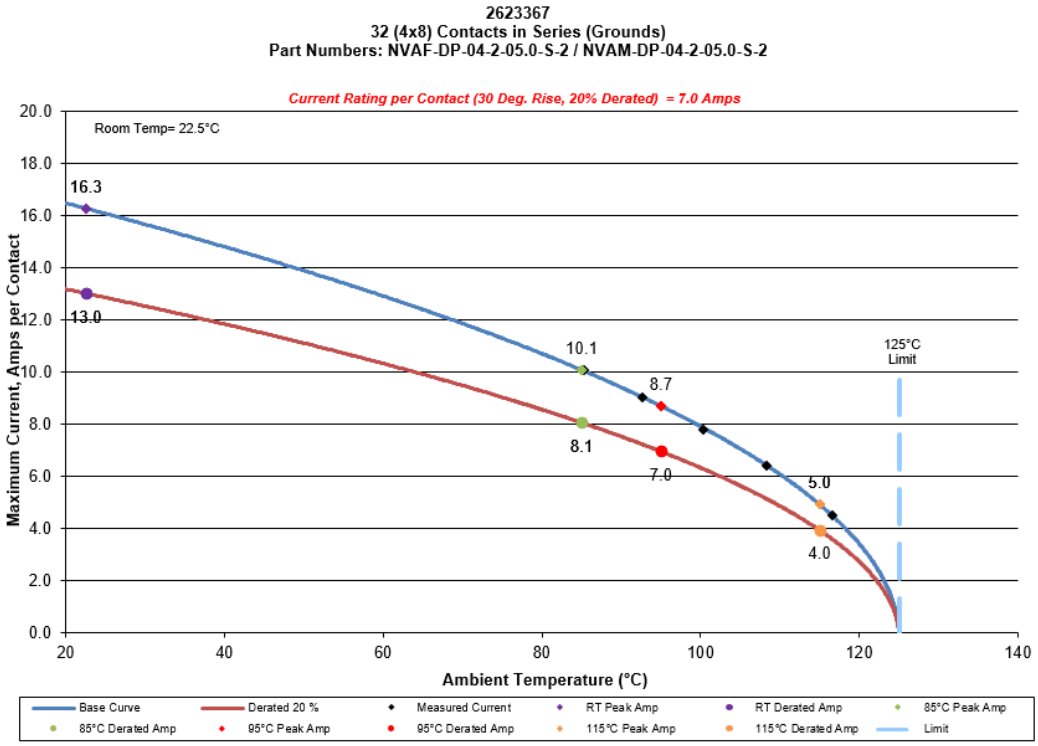
h. Linear configuration with 16 adjacent conductors/contacts powered

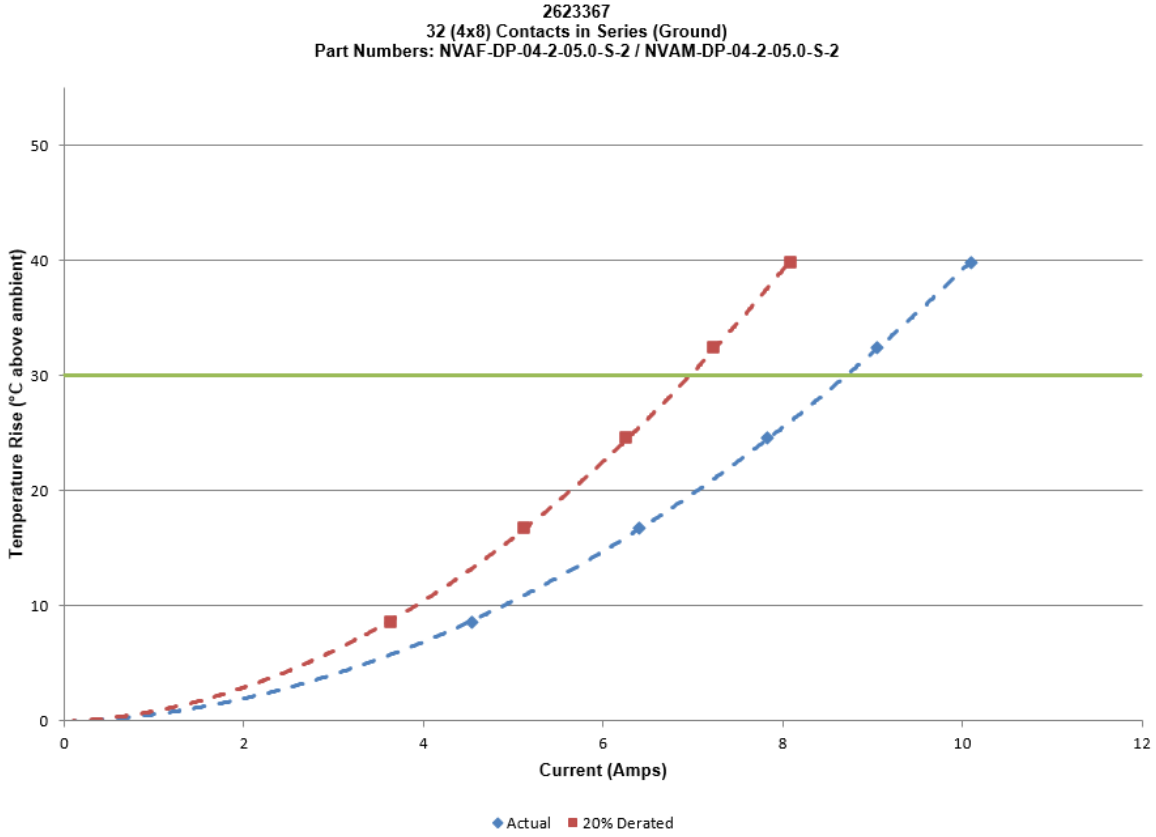




DATA SUMMARIES Continued

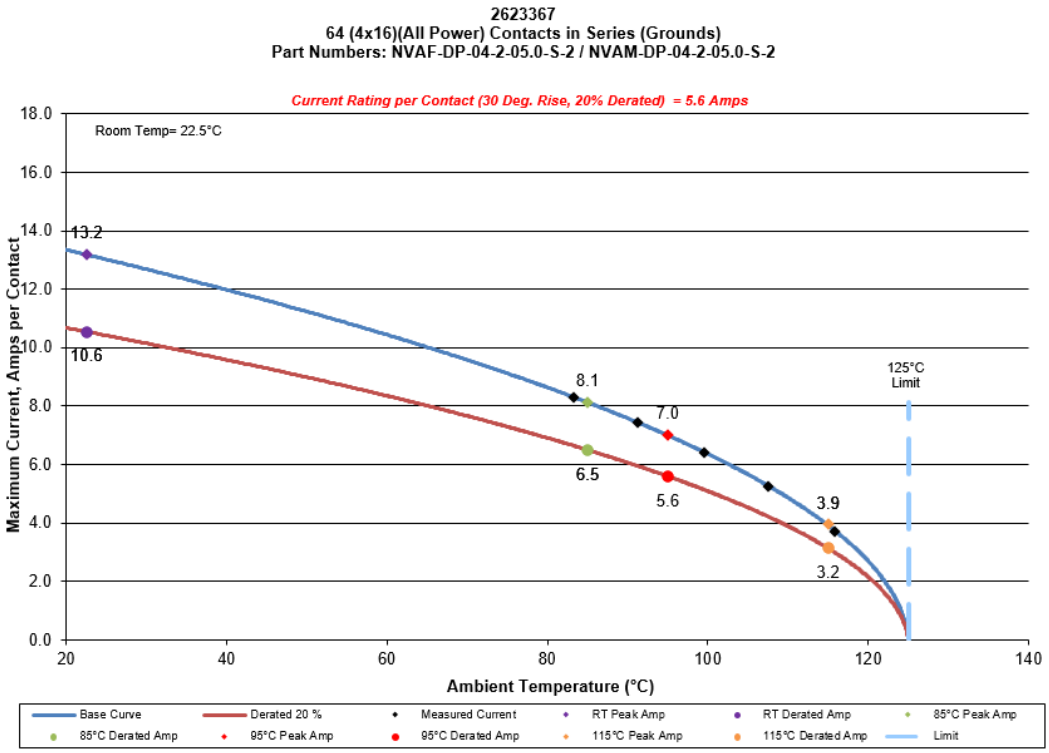
i. Linear configuration with 32 adjacent conductors/contacts powered

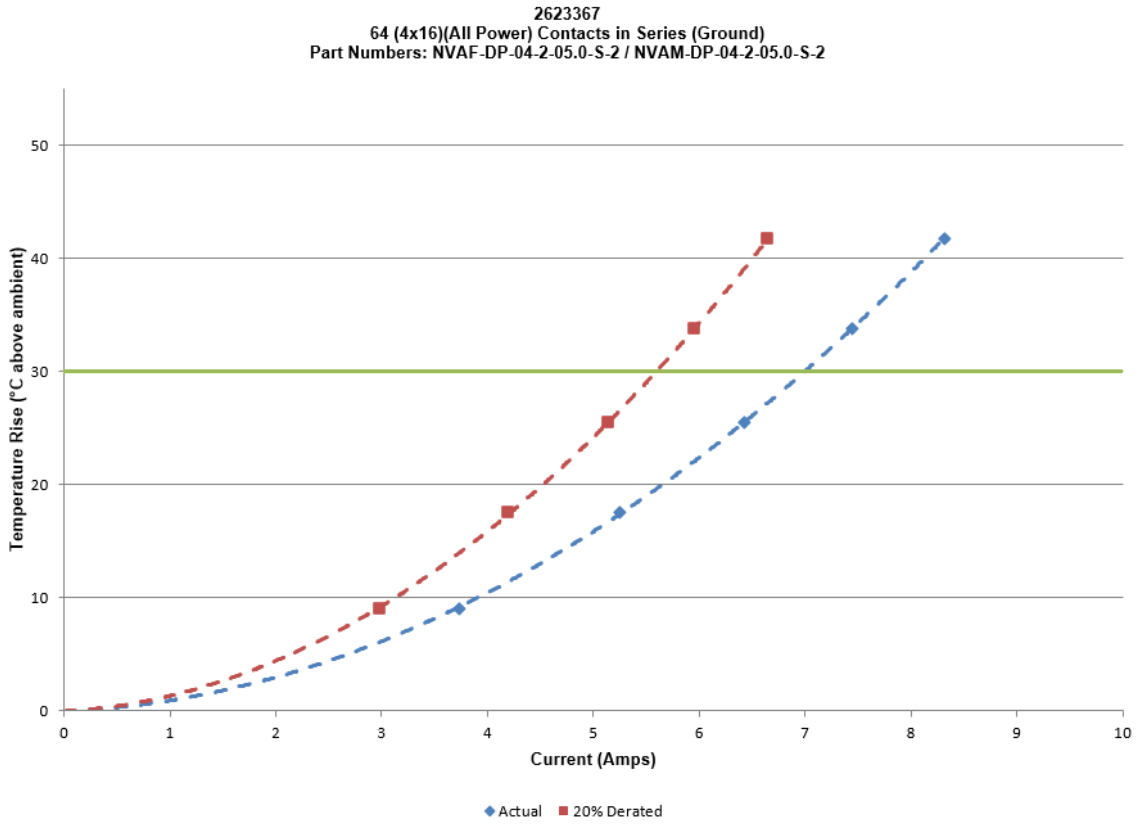




DATA SUMMARIES Continued

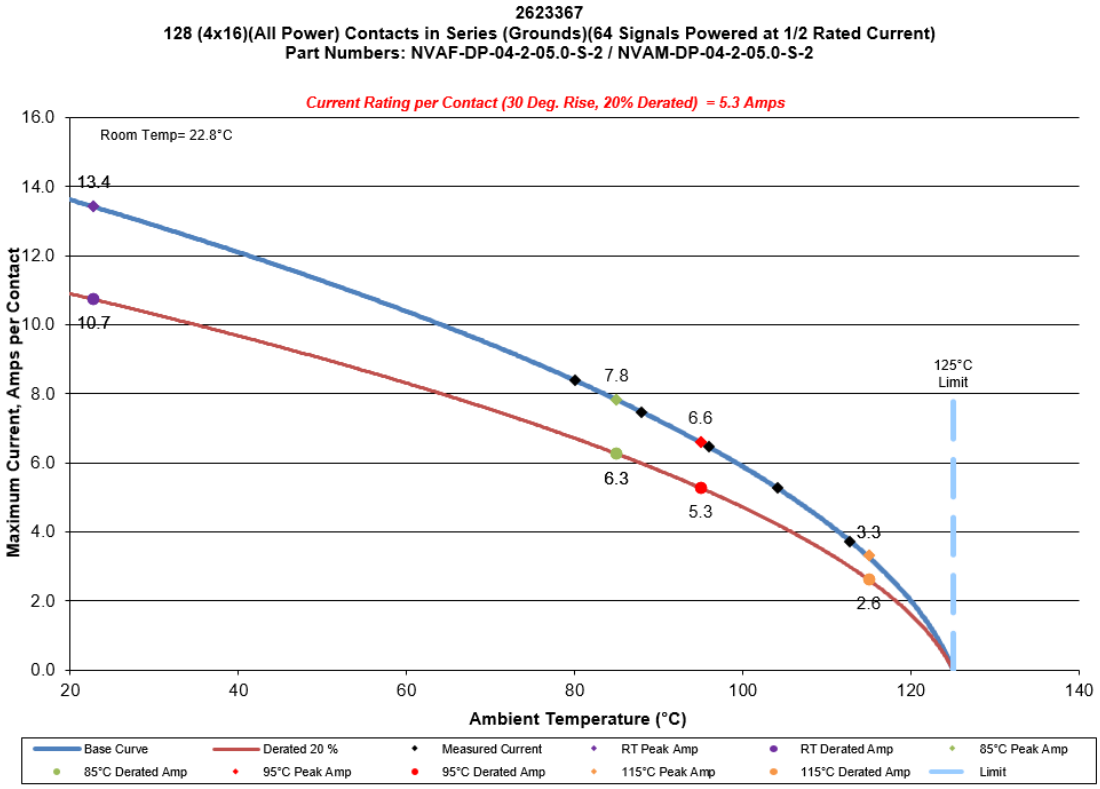
j. Linear configuration with all adjacent conductors/contacts powered

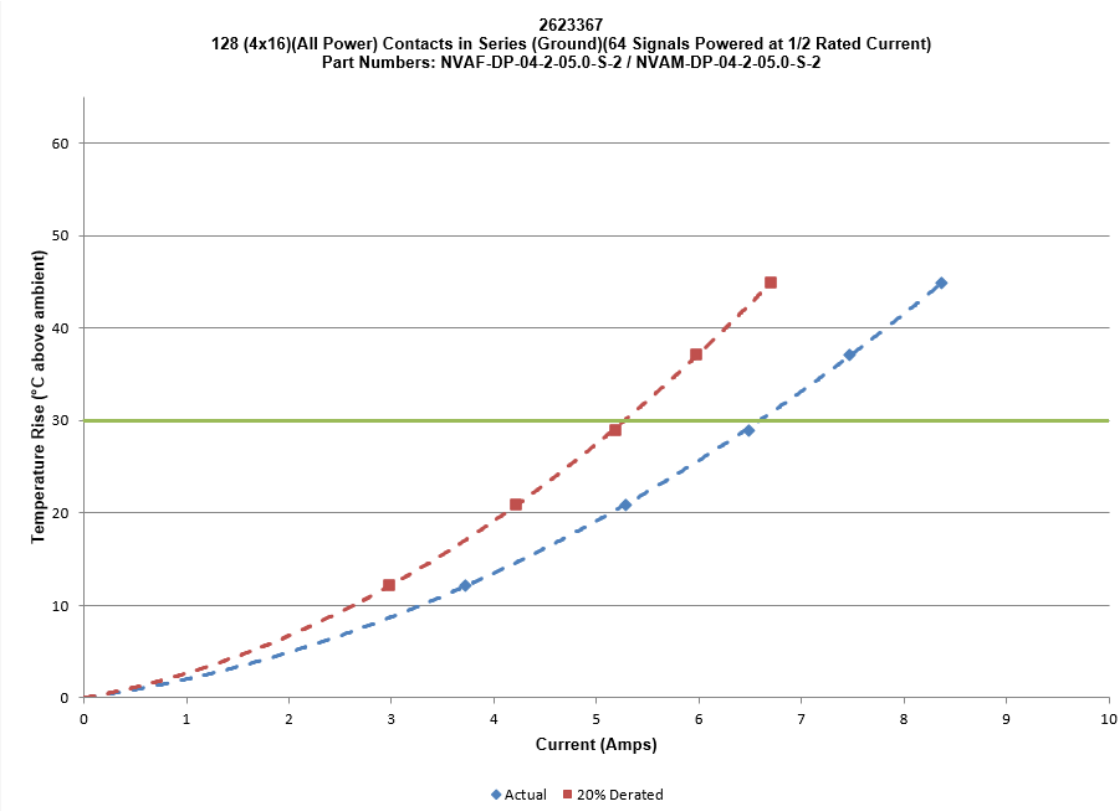




DATA SUMMARIES Continued

k. Linear configuration with all adjacent signal conductors and ground conductors/contacts powered





DATA SUMMARIES Continued

MATING-UNMATING FORCE:

Mating-Unmating Durability Group

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	51.29	11.53	35.41	7.96	61.38	13.80	35.90	8.07
Maximum	84.51	19.00	45.73	10.28	89.27	20.07	55.91	12.57
Average	63.07	**14.18**	39.66	**8.92**	76.65	**17.23**	45.90	**10.32**
St Dev	10.75	2.42	3.88	0.87	8.85	1.99	5.82	1.31
Count	8	8	8	8	8	8	8	8

	After Humidity			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	38.83	8.73	23.71	5.33
Maximum	57.51	12.93	34.69	7.80
Average	45.93	**10.33**	28.55	**6.42**
St Dev	6.18	1.39	3.64	0.82
Count	8	8	8	8

DATA SUMMARIES Continued

LLCR Mating/Unmating Durability Group

1). A total of 128 signal and 64 ground 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. <= +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

	LLCR Measurement Summaries by Pin Type			
Date	1/20/2021	1/25/2021	2/17/2021	3/1/2021
Room Temp (Deg C)	23	23	22	22
Rel Humidity (%)	39	36	32	41
Technician	Scott Rollefstad	Scott Rollefstad	Scott Rollefstad	scott rollefstad
mOhm values	Actual **Initial**	**Delta Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type: Signal 1			
Average	33.56	0.77	0.75	0.75
St. Dev.	0.66	0.81	0.75	0.74
Min	30.35	0.00	0.00	0.04
Max	34.84	4.79	4.32	4.51
Summary Count	128	128	128	128
Total Count	128	128	128	128
	Pin Type: Ground 1			
Average	0.30	0.06	0.07	0.05
St. Dev.	0.05	0.06	0.06	0.06
Min	0.21	0.00	0.00	0.00
Max	0.49	0.37	0.34	0.36
Summary Count	64	64	64	64
Total Count	64	64	64	64

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

DATA SUMMARIES Continued

LLCR Shock & Vibration Group

1) A total of 128 signal and 64 ground 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. <= +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

	LLCR Measurement Summaries by Pin Type			
Date	1/25/2021	2/10/2021		
Room Temp (Deg C)	23	22		
Rel Humidity (%)	38	36		
Technician	Scott Rollefstad	Scott Rollefstad		
mOhm values	Actual **Initial**	**Delta** **Shock-Vib**		
	Pin Type: Signal 1			
Average	34.75	0.38		
St. Dev.	0.82	0.29		
Min	32.27	0.01		
Max	36.84	1.25		
Summary Count	128	128		
Total Count	128	128		
	Pin Type: GND 1			
Average	0.28	0.02		
St. Dev.	0.02	0.02		
Min	0.22	0		
Max	0.34	0.06		
Summary Count	64	64		
Total Count	64	64		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Shock-Vib	**192**	**0**	**0**	**0**	**0**	**0**

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	60
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
Total Events	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: 4/26/2021, Next Cal: 4/25/2022

Equipment #: HZ-THC-01
Description: Humidity transmitter
Manufacturer: Thermtron
Model: SM-8-8200
Serial #: 38846
Accuracy: Last Cal: 2/28/2021, Next Cal: 2/27/2022

Equipment #: HZ-TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnatti Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14994
Accuracy: See Manual
… Last Cal: 06/28/2020, Next Cal: 06/27/2021

Equipment #: HZ-MO-05
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 3706
Serial #: 1285188
Accuracy: Last Cal: 11/15/2020, Next Cal: 11/14/2021

Equipment #: HZ-MO-01
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 2700
Serial #: 1199807
Accuracy: Last Cal: 04/28/2021, Next Cal: 04/27/2022

Equipment #: HZ-PS-01
Description: Power Supply
Manufacturer: Agilent
Model: 6031A
Serial #: MY41000982
Accuracy: Last Cal: 04/28/2021, Next Cal: 04/27/2022

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 04/30/2021, Next Cal: 04/30/2022

EQUIPMENT AND CALIBRATION SCHEDULES Continued

Equipment #: SVC-01
Description: Shock & Vibration Table
Manufacturer: Data Physics
Model: LE-DSA-10-20K
Serial #: 10037
Accuracy: See Manual
… Last Cal: 11/31/2020, Next Cal: 11/31/2021

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 07/09/2020, Next Cal: 07/09/2021

Equipment #: ED-03
Description: Event Detector
Manufacturer: Analysis Tech
Model: 32EHD
Serial #: 1100604
Accuracy: See Manual
… Last Cal: 06/04/2020, Next Cal: 06/04/2021