Product Data Sheet

3M™ Serial Attached SCSI (SAS) Boardmount Plugs and Receptacles

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1.0 Scope

This data sheet summarizes test methods, test conditions and product performance for the 3M Serial Attached SCSI (SAS) Plugs and Receptacles.

2.0 Product Tested

Product:	SAS 29P boardmount plugs and receptacles
Product Number:	SBR-XX-29-X-ML (receptacles) & SBH-XX-29-XX-ML (plugs)
Related Specification Sheet:	TS-2176, TS-2177, TS-2178, TS-2179, TS-2180, TS-2205, TS-2213

3.0 General Conditions

3.1 Test Specimens

The test specimens shall be strictly in compliance with the design, construction details and physical properties detailed in the relevant Technical Specification Sheet (See Section 2).

3.2 Standard Test Conditions

The test shall be done under the following conditions:

Temperature:	15°C to 35°C
Relative Humidity:	45% to 75%
Atmospheric pressure:	650 to 800 mmHg

4.0 Test Results Summary

Items		Specification (per SAS 1.1 & SFF-8482)	Test Method	Results
General	Visual	No defects such as deformation, blister, damage, crack, etc.	EIA-364-18A	Pass
	Low Level Contact Resistance	Max. Δ R: < 30 mΩ	EIA-364-23A	Pass
Environmental	Temperature Life (Thermal Aging)	No Physical abnormalities after test Max. Δ R: < 15 mΩ 85°C for 500 Hours	EIA-364-17A Condition iii, Method A	Pass
	Humidity	Max. Δ R: <15 mΩ Conditions: 40°C/90-95%RH for 96 Hours	EIA-364-31A Method ii, Condition A	Pass
	Thermal Shock	No Physical abnormalities after test Max. Δ R: <15 mΩ 10 Cycles –55°C to +85°C	EIA-364-32B Condition I	Pass
	Mixed Flowing Gas	No Physical abnormalities after test Max. Δ R: <15 mΩ Half of samples are exposed unmated for 7 days & then mated for 7 additional days. Other half of samples exposed mated for full 14 day test.	EIA-364-65 Class IIA	Pass
Mechanical	Mating and Unmating Forces	Mating force: 50N Max Unmating force: 5N Min Backplane	EIA-364-13A	Pass
	Durability	500 Insertions/Withdrawals Max. Δ R: <15 mΩ	EIA-364-09B	Pass
	Vibration	No Physical abnormalities after test Max. Δ R: <15 mΩ 20 – 500 Hz; 3.10 g RMS No electrical discontinuity > 1 µsec	EIA-364-28D Test Condition VII letter D	Pass
	Mechanical Shock	No Physical abnormalities after test 50g 11ms ½ sine ± X,Y,Z Max. Δ R: <15 mΩ No electrical discontinuity > 1µ sec	EIA-364-27B Condition A	Pass
Electrical	Dielectric Withstanding Voltage	500V_{rms} @ Sea Level	EIA-364-20 Method B	Pass
	Insulation Resistance	Minimum 1000 Mohm @ 500 V_{dc}	EIA-364-21A	Pass
	Current Rating	Δ T: 30°C max @ 6 Amps total	EIA-364-70	Pass
Signal Integrity	Impedance	100 +/- 15 ohms with 70ps risetime (80/20%)	EIA-364-108	Pass
	Eye pattern	Opening > 50% at 3 Gbps/channel (3M criteria; not specified in SAS 1.1)	EIA-364-107	Pass

5.0 Testing

Test methods are based upon EIA Standard 364.

5.1 General

Visual (Appearance) — EIA-364-18

Purpose

The purpose of this test is to visually examine and dimensionally inspect the connector in order to determine whether the connector conforms to the applicable specification and detail documents not covered by performance requirements.

Test Method

The examination shall be made in accordance with EIA-364-18. The visual examination shall include inspection of the following features as a minimum: workmanship, marking, materials, finish, standards, design and construction. The dimensional inspection shall be a check for compliance with the outline drawings of the detail specification.

Low Level Contact Resistance — EIA-364-23

Purpose

The purpose of this test is to evaluate contact resistance characteristics of electrical contacts under conditions where applied voltages and currents do not alter the physical contact interface or modify the conductive oxide films which may be present.

Test Method

The low-signal level contact resistance shall be tested in accordance with EIA-364-23 with circuit current of "X" mA maximum and open circuit voltage of "X" mV maximum. The termination resistance includes contact to wire interface resistance, bulk resistance of contact, and resistance of solder joints of connectors to circuit boards. The initial readings are in milli-ohms. All other readings are the change in resistance from the initial reading in milli-ohms.

5.2 Environmental

Temperature Life — EIA-364-17

Purpose

The purpose of this test is to determine the effects on the electrical and mechanical characteristics of the connector resulting from exposure of the connector to an elevated ambient temperature for a specified length of time.

Test Method

Mated connectors shall be tested in accordance with EIA-364 17, Method III, Test Condition A.

Temperature:	85°C
Duration:	500 hours

Test Results

	Initial R mΩ	Final Δ R mΩ
Maximum:	20.31	3.89
Average:	16.93	-0.07
Minimum:	14.25	-4.56
Standard Deviation:	1.24	1.66

Humidity — EIA-364-31

Purpose

The purpose of this test is to permit evaluation of the properties of materials used in connectors as they are influenced or deteriorated by the effects of high humidity and heat condition.

Test Method

Mated connectors shall be tested in accordance with EIA-364-31, Test Condition A, Method II.

Temperature:	40°C
Relative Humidity:	90 – 95% RH
Duration:	96 hours

Test Results

	Initial R mΩ	Final Δ R mΩ
Maximum:	19.43	4.57
Average:	16.79	0.35
Minimum:	13.53	-3.68
Standard Deviation:	1.26	1.84

Thermal Shock — EIA-364-32

Purpose

The purpose of this test is to determine the resistance of a given electrical connector to exposure at extremes of high and low temperatures and to the shock of alternate exposures to these extremes, simulating the worst probable conditions of storage, transportation and application.

Test Method

Mated connectors shall be tested in accordance with EIA-364-32**,** Test Condition I.

Temperature:	-55°C & +85°C
Cycle Time:	30 minutes each Temperature
Transition Time:	1 minute maximum
Cycles:	10

Test Results

	Initial R mΩ	Final Δ R mΩ
Maximum:	19.43	4.83
Average:	16.79	0.57
Minimum:	13.53	-3.57
Standard Deviation:	1.26	1.79

Mixed Flowing Gas — EIA-364-65

Purpose

The purpose of this test is to determine the effects of a controlled environmentally related corrosive atmosphere atmosphere on the electrical connector.

Test Method

Mated connectors shall be tested in accordance with EIA-364-65, Class IIA.

Relative Humidity:	70 ±2%
Temperature:	30 ±2 °C
Cl_2:	10 ±3 ppb
No_2:	200 ±50 ppb
H_2S:	10 ±5 ppb
So_2:	100 ±20 ppb

Test Results

	Initial R mΩ	Final Δ R mΩ
Maximum:	20.11	14.95
Average:	17.37	3.50
Minimum:	13.22	-4.02
Standard Deviation:	1.31	4.74

5.3 Mechanical

Mating and Unmating Forces — EIA-364-13A

Purpose

The purpose of this test is to determine the mechanical forces required to mate and unmate electrical connectors.

Test Method

The mechanical forces required to mate and unmate these electrical connectors shell be determined in accordance with EIA-364-13A.

Test Results

Force (units):	Newtons
Mating:	24.9 Max.
Unmating:	14.3 Min.

Durability — EIA-364-09B

Purpose

The purpose of this test is to determine the effects of subjecting electrical connectors to a conditioning action of mating and unmating of connector simulating operations approximating the life of the connector.

Test Method

Connector durability shall be tested in accordance with EIA-364-09B

Condition:	500 Cycles

Test Results

	Initial R mΩ	Final Δ R mΩ
Maximum:	19.66	4.85
Average:	16.54	0.21
Minimum:	14.27	-4.62
Standard Deviation:	1.22	1.63

Vibration — EIA-364-28D

Purpose

The purpose of this test is to determine the effects of vibration within the predominant or random vibration frequency ranges and magnitudes that may be encountered during the life of the connector.

Test Method

Mated connectors shall be tested in accordance with EIA-364-28D, Test Condition VII letter D

Frequency:	20 – 500 Hz
g:	3.10 g RMS
Duration:	15 min

Test Results

	Initial R mΩ	Final Δ R mΩ
Maximum:	19.66	4.37
Average:	16.51	0.43
Minimum:	14.27	-4.37
Standard Deviation:	1.22	1.63

Mechanical Shock — EIA-364-27B

Purpose

This test is conducted to determine the suitability of connectors when subjected to shocks such as those expected from rough handling, transportation and operation.

Test Method

Mated connectors shall be tested in accordance with EIA-364-27B, Test Condition "A".

Normal Duration:	11 milliseconds
Peak Acceleration:	50g
Wave form:	½ sine
Cycles:	3 times each in +/-X, Y & Z

Test Results

	Initial R mΩ	Final Δ R mΩ
Maximum:	19.66	4.00
Average:	16.51	0.76
Minimum:	14.27	-2.78
Standard Deviation:	1.22	1.51

5.4 Electrical

Dielectric Withstanding Voltage — EIA-364-20A

Purpose

The purpose of this test is to prove that a given electrical connector can operate safely at its rated voltage and withstand momentary overpotentials due to switching, surges, and other similar phenomena.

Test Method

Withstanding voltage shall be tested in accordance with EIA-364-20A.

Applied Voltage:	500 V_{ac} RMS
Duration:	1 minute
Observation:	Check for evidence of a breakdown

Test Results

Result:	Pass

Insulation Resistance — EIA-364-21A

Purpose

The purpose of this test is to establish the methods and procedures to be followed in determining the resistance offered by the insulation materials and the various seals of a connector to a direct current potential tending to produce a leakage of current through or on the surface of these members.

Test Method

Insulation resistance shall be tested in accordance with EIA-364-21A.

Applied Voltage:	500 V_{DC}
Duration:	1 minute

Test Results

	Resistance in MΩ
Minimum:	1042

Current Rating — EIA-364-70

Purpose

The purpose of this test is to establish the current rating of the connector.

Test Method

The temperature rise vs. current relationship shall be determined in accordance with SFF-8482 and EIA-364-55, Table 2 Method 4.

Current:	6 Amps
Δ T Max:	30°C

Test Results

	Δ T
Maximum:	22°C

5.5 Signal Integrity

Impedance— EIA-364-108

Purpose

The purpose of this test is to establish the impedance of the product.

Test Method

The impedance shall be determined in accordance with EIA-364-108

Impedance:	100 +/- 15 ohms
Risetime:	70 ps (80/20%)

Test Results

	Ohms
Maximum:	103.2
Minimum:	85.7

Eye pattern— EIA-364-107

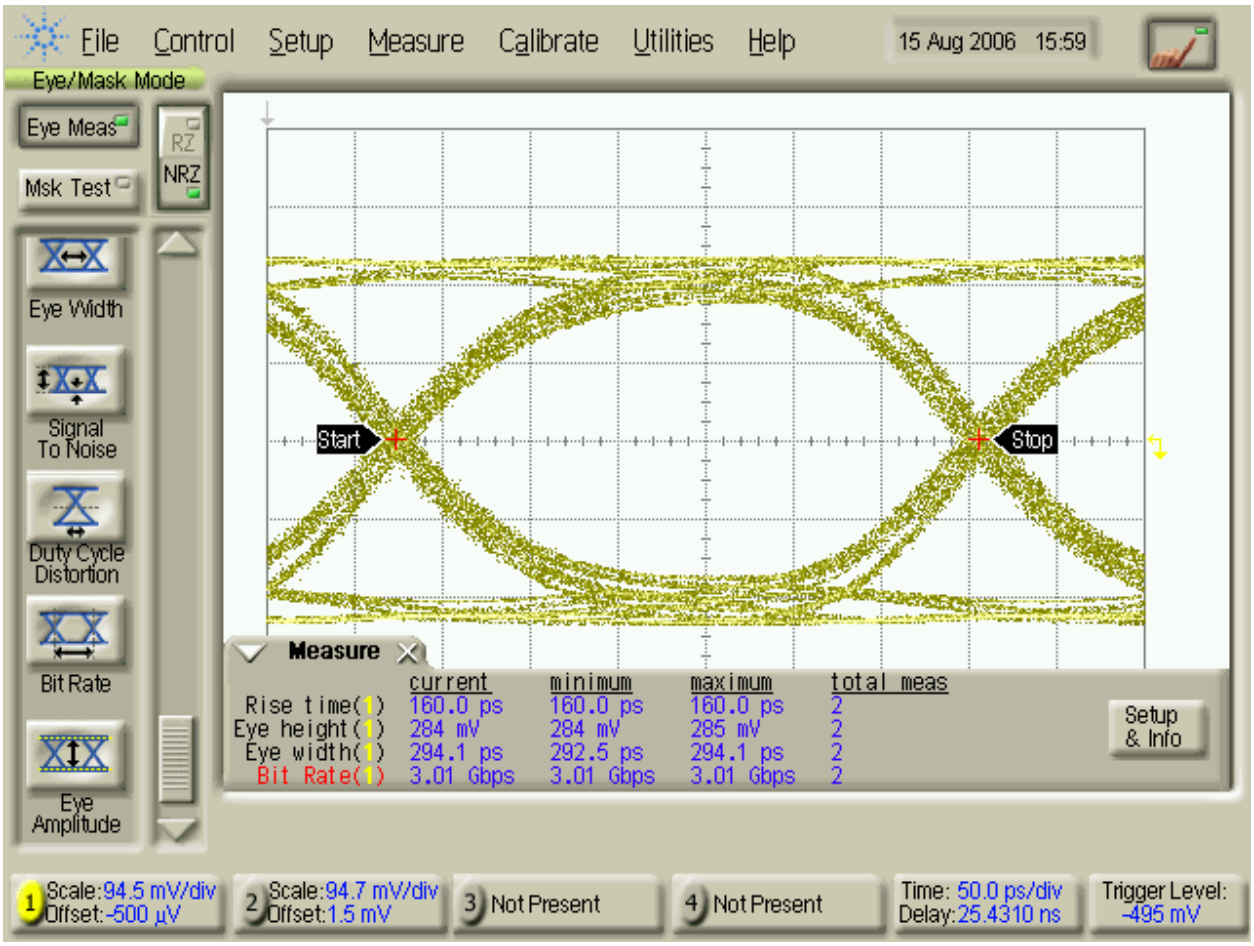
Purpose

The purpose of this test is to prove that the mated connector pair is able to support the data transmission rate of 3.0 Gbps.

Test Method

Eye pattern shall be tested in accordance with the SAS standard. All signal pairs tested (representative eye pattern depicted below).

Test Results



6.0 Heat Resistance

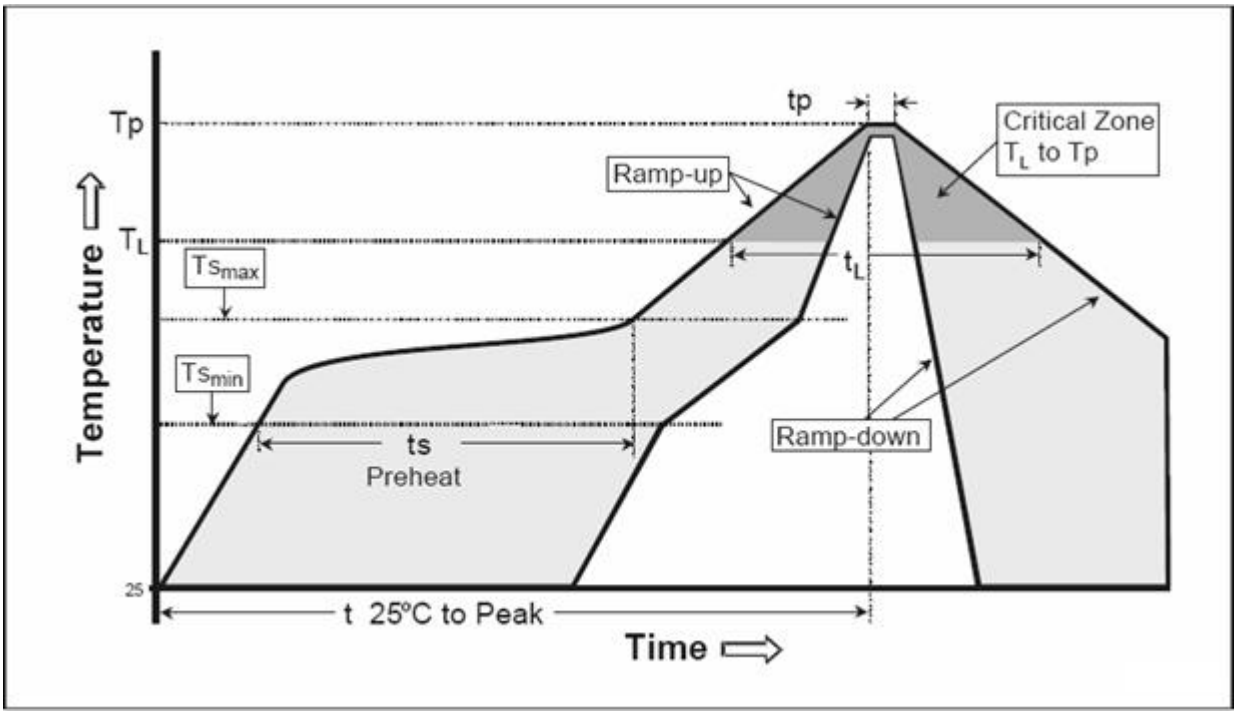
Purpose

Purpose of this test is to assure that the part does not deform, crack, craze, blister or split under the heat environment needed for assembling RoHS parts and soldering with non-leaded solder.

Test Method

The 3M Serial Attached SCSI (SAS) family of parts is JEDEC-20C compliant. The SAS parts have been tested as per the temperature profile shown below and meet the requirements for MSL level 1.

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (Tsmax to Tp)	1-3 ºC / Sec
Preheat –Temperature Min (Tsmin) –Temperature Max (Tsmax) –Time (tsmin to tsmax)	150 °C 200 °C 60-180 seconds
Time maintained above: – Temperature (TL) – Time (tL)	217 °C 60-150 seconds
Peak/Classification Temperature (Tp)	260 °C
Time within 5 °C of actual Peak Temperature (tp)	20-30 seconds
Ramp-Down Rate	1-4 ºC / Sec
Time 25 °C to Peak Temperature	220 sec maximum



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