Product Data Sheet

3M™ Serial Advanced Technology Attachment (SATA) Boardmount Plug, Receptacle and Cable Assemblies

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1.0 Scope

This data sheet summarizes test methods, test conditions and product performance for the 3M Serial Advanced Technology Attachment (SATA) Series Connector, both plug and receptacle and 3M Serial Advanced Technology Attachment (SATA) Cable assemblies, plated with gold at the mating area.

2.0 Product Tested

Product:	SATA Boardmount Plug , Receptacle and Cable Assemblies
Product Number:	5622-XX0X-ML, 5607-XX0X-ML, 5602-XX0X, 5601-22-127-200
Related Specification Sheet:	TS-2108, 2109, 2110, 2111, 2201, 2202

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	Test Method	Results
General	Visual	• No defects such as deformation, blister, damage, crack, etc.	EIA-364-18A	Pass
	Low Level Contact Resistance	• Max. R (Initial): <30 mΩ • Change in Δ R < 15 mΩ	EIA-364-23A	Pass
Environmental	Temperature Life (Thermal Aging)	• No physical abnormalities after test • Max. Δ R: <15 mΩ	EIA 364-17 Test Condition III Method A.	Pass
	Humidity	• No physical damage • Max. Δ R: <15 mΩ •	EIA 364-31 Method II Test Condition A.	Pass
	Thermal Shock	• No physical abnormalities after test • Max. Δ R: <15 mΩ	EIA 364-32 Test Condition I.	Pass
	Mixed Flow Gas	• No physical abnormalities after test	EIA 364-65, Class 2A	Pass
Mechanical	Durability	• No physical abnormalities after test • 50 cycles for internal cabled appl. • 500 cycles for backplane appl.	EIA-364-09B	Pass
	Mechanical Shock	• No physical abnormalities after test • Max. Δ R: <15 mΩ • No electrical discontinuity > 1 µ sec	EIA 364-27 Condition H	Pass
	Random Vibration	• No physical abnormalities after test • Max. Δ R: <15 mΩ • No electrical discontinuity > 1 µ sec	EIA 364-28 Condition V Test letter A	Pass
	Removal Force	• 10 N minimum	EIA-364-13	Pass
	Insertion Force	• 45 N maximum	EIA 364-13	Pass
Electrical	Dielectric Withstanding Voltage	• $500V_{rms}$ @ sea level	EIA-364-20B	Pass
	Insulation Resistance	• 1×10^9 Ohms @ 500 V_{dc}	EIA-364-21	Pass
Signal Integrity	Impedance	• 100 ± 15 Ohms @ 70 ps • (20% - 80%)	SATA 1.0a	Pass
	Eye Pattern	• NA	SATA 1.0a	Pass
	Intra-Pair Skew	• 10 ps Max	SATA 1.0a	Pass
	Crosstalk: NEXT	• -26 dB	SATA 1.0a	Pass
	Rise time	• 85 ps	SATA 1.0a	Pass

5.0 Testing

Test methods are based upon EIA Standard 364.

5.1 General

Visual (Appearance) — EIA-364-18A

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-364-18A. 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-364-23A

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-364-23A with circuit current of 100 mA maximum and open circuit voltage of 20 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-364-17A

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 - 17A, Method A, Test Condition III.

Temperature:	85°C
Current:	W/O current load
Duration:	500 hours
Readings:	Final ΔR
High	4.02 mΩ
Mean	1.69 mΩ
Low	2.98 mΩ

Humidity — EIA-364-31A

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, steady state humidity.

Temperature Range:	40°C
Relative Humidity:	90% to 95%
Duration:	96 Hours
Readings:	Final ΔR
High	3.11 mΩ
Mean	1.10 mΩ
Low	2.14 mΩ

Thermal Shock — EIA-364-32B

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:	5 minute maximum (using 2 chambers)
Cycles:	10
Readings:	Final ΔR
High	3.99 mΩ
Mean	1.55 mΩ
Low	2.47 mΩ

Mixed Flow Gas — EIA-364-65

Purpose

The purpose of this test is to determine the reaction of plated or unplated surfaces when exposed to different concentration of flowing gas mixtures, produced for environmentally related corrosive atmospheres.

Test Method

Mated connectors shall be tested in accordance with EIA-364-65**,** Class 2A.

Test Condition	Class II A Cl_2 : 10 ±3 ppb NO_2 : 200 ±50 ppb H_2S : 10 ±5 ppb SO_2 : 100 ±20 ppb Temperature: 30 ±1◦ C Relative humidity: 70 ±2 %RH Duration : 14 days
Readings:	Final ΔR
High	12.52 mΩ
Mean	9.19 mΩ
Low	5.08 mΩ

5.3 Mechanical

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. 50 cycles for the internal cabled application, and 500 cycles for the backplane/blindmate application.

Readings:	Final ΔR
High	4.52 mΩ
Mean	1.77mΩ
Low	2.57 mΩ

Mechanical Shock — EIA-364-27A

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-364-27A, Test Condition H.

Normal Duration:	11 milliseconds
Peak Acceleration:	30g
Wave Form:	Half sine
Cycles:	3 shocks at each mutually perpendicular axes X, Y & Z (18 shocks)
Velocity Change:	6.8 ft/s
Current:	100 mA all contacts
Readings:	Final ΔR
High	3.44 mΩ
Mean	1.02 mΩ
Low	2.41mΩ

Random Vibration — EIA-364-28A

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-364-28A, Test Condition V, Test Letter A

Frequency:	50 Hz to 2000 Hz 6 dB/octave - 50 Hz to 100 Hz, 6 dB/octave - 100 Hz to 1000 Hz 6 dB/octave - 1000 Hz to 2000 Hz
Upper and Lower Tolerance Limits:	±1.5 dB
Power Spectral Density:	.02
Overall $_{rms}$ G Min.:	5.2
Duration:	30 minutes at each axis
Readings:	Final ΔR
High	3.03mΩ
Mean	0.98 mΩ
Low	1.87mΩ

Insertion and Removal Forces — EIA-364-13

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-364-13.

Force	Initial	500 Cycles
Insertion	24.01N	23.24N
Withdrawal	14.30N	13.52N

Contact Retention — EIA-364-29A

Purpose

The purpose of this test is to impose axial forces on the connector contacts to determine the ability of the connector to withstand forces that tend to displace contacts from their proper location within the connector body and resist contact pullout and pushout.

Test Method

Contact retention shall be tested in accordance with EIA-364-29A.

Grams	
High	1000g
Mean	822g
Low	700g
St. Dev	600g

5.4 Electrical

Dielectric Withstanding Voltage — EIA-364-20B

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-364-20B. All contacts wired to test opposing and adjacent pairs of contacts.

Applied Voltage:	500 V_{ac}
Duration:	1 minute
Measurement:	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. All contacts wired to evaluate opposing and adjacent pairs of contacts.

500 V_{dc}	
1 Minute	
Insulation Resistance	
Readings	Ohms
1	2.16GΩ
2	3.03GΩ
3	3.15GΩ
4	2.81GΩ
5	3.03GΩ

5.5 Signal Integrity

Mated Connector Impedance — SATA 1.0a

Purpose

The purpose of this test is to prove that the mated connector pair meets the differential impedance as required for the backplane application.

Test Method

Character impedance shall be tested in accordance with SATA 1.0a. All signal contacts in the primary and secondary port of the connector has been used for the measurement.

Rise Time (20%-80%):	70 ps
Impedance :	100 ± 15 Ω
Measurement:	Pass

Eye Pattern — SATA

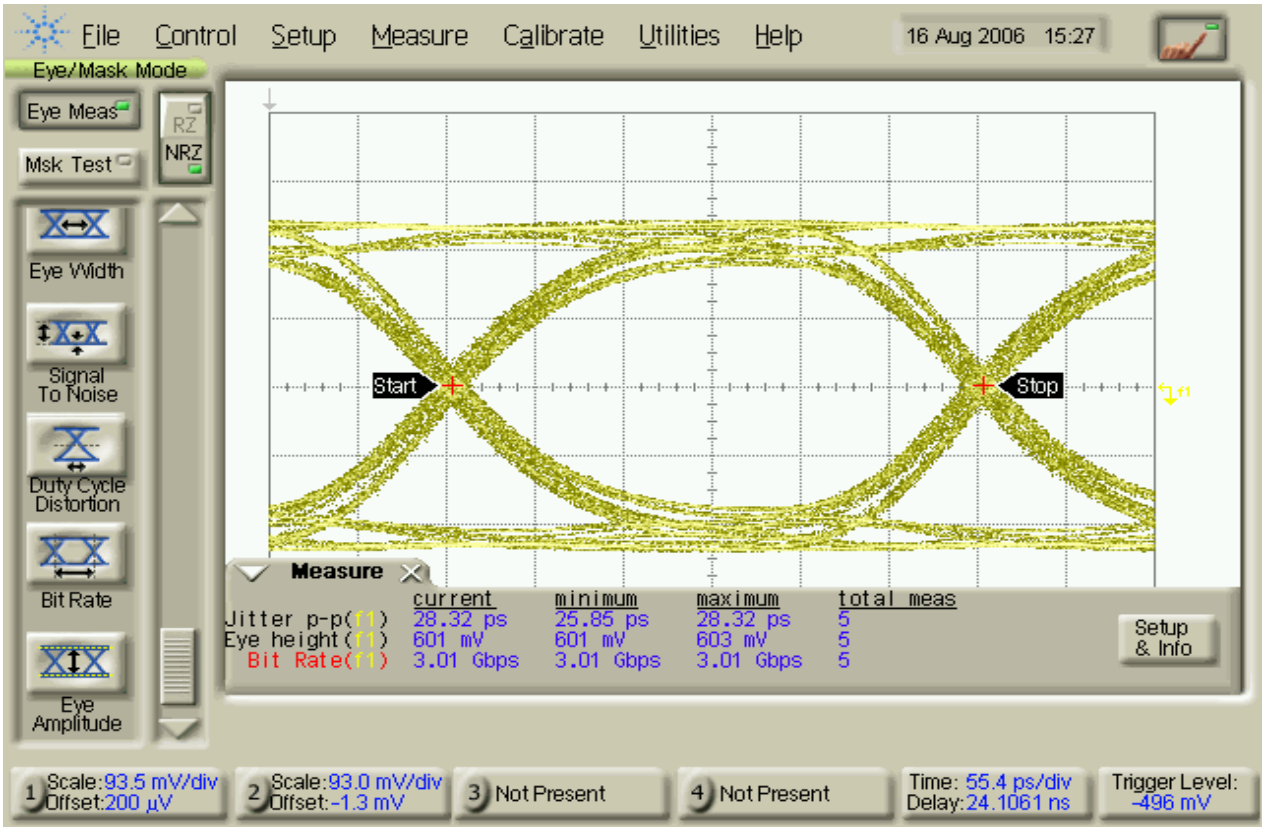
Purpose

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

Test Method

Eye Pattern shall be tested in accordance with SATA standard. All signal contacts in the connector has been used for the measurement.

Date Rate :	3.0 Gbps
Measurement:	Pass



Intra-Pair Skew — SATA 1.0a

Purpose
The purpose of this test is to determine the propagation delay caused during the transmission.

Test Method
Intra-pair skew has been determined following the specification SATA 1.0.

Maximum Allowed Skew :	10 PS
Measurement:	Pass

Cross Talk : NEXT — SATA 1.0a

Purpose
The purpose of this test is to determine the signal interference between the pairs caused by the electromagnetic fields present in the surroundings.

Test Method
NEXT is determined following the specification SATA 1.0.

NEXT :	-26 dB
Measurement:	Pass

Rise Time — SATA 1.0a

Purpose
The purpose of this test is to determine the change in the rise time of the transmitted signal at the connector interface.

Test Method
NEXT is determined following the specification SATA 1.0.

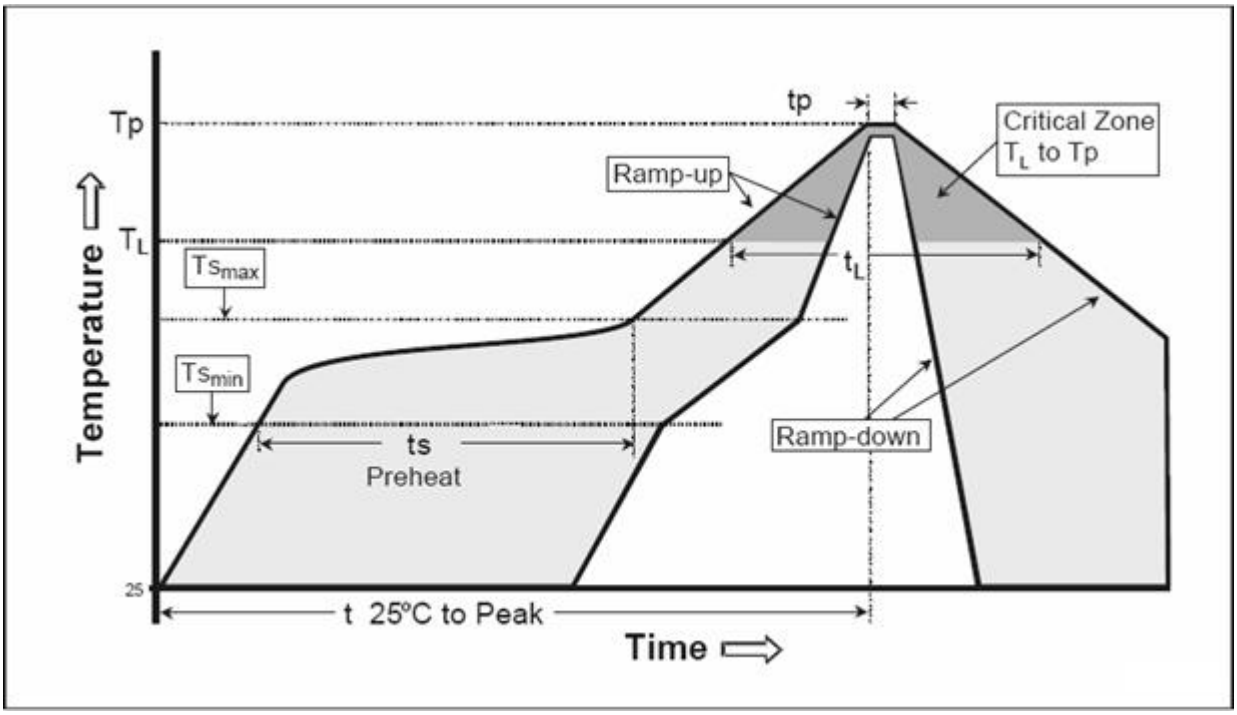
NEXT :	85 PS
Measurement:	Pass

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 Advanced Technology Attachment (SATA) family of parts is JEDEC-20C compliant. The SATA 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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