SPECIFICATION

AND PERFORMANCE CHARACTERISTICS

OF “DVI” MALE AND FEMALE

CONNECTOR SERIES

CONTENTS

1.0 SCOPE

1.1 This specification establishes the performance characteristics of the high-speed digital connection DVI interface between a personal computing device and a display device.

1.2 Should any difference occur between this specification and any document specified in Section 2, this specification shall prevail. In addition, if any difference occurs between this specification and the individual part drawings, then the part drawings shall prevail.

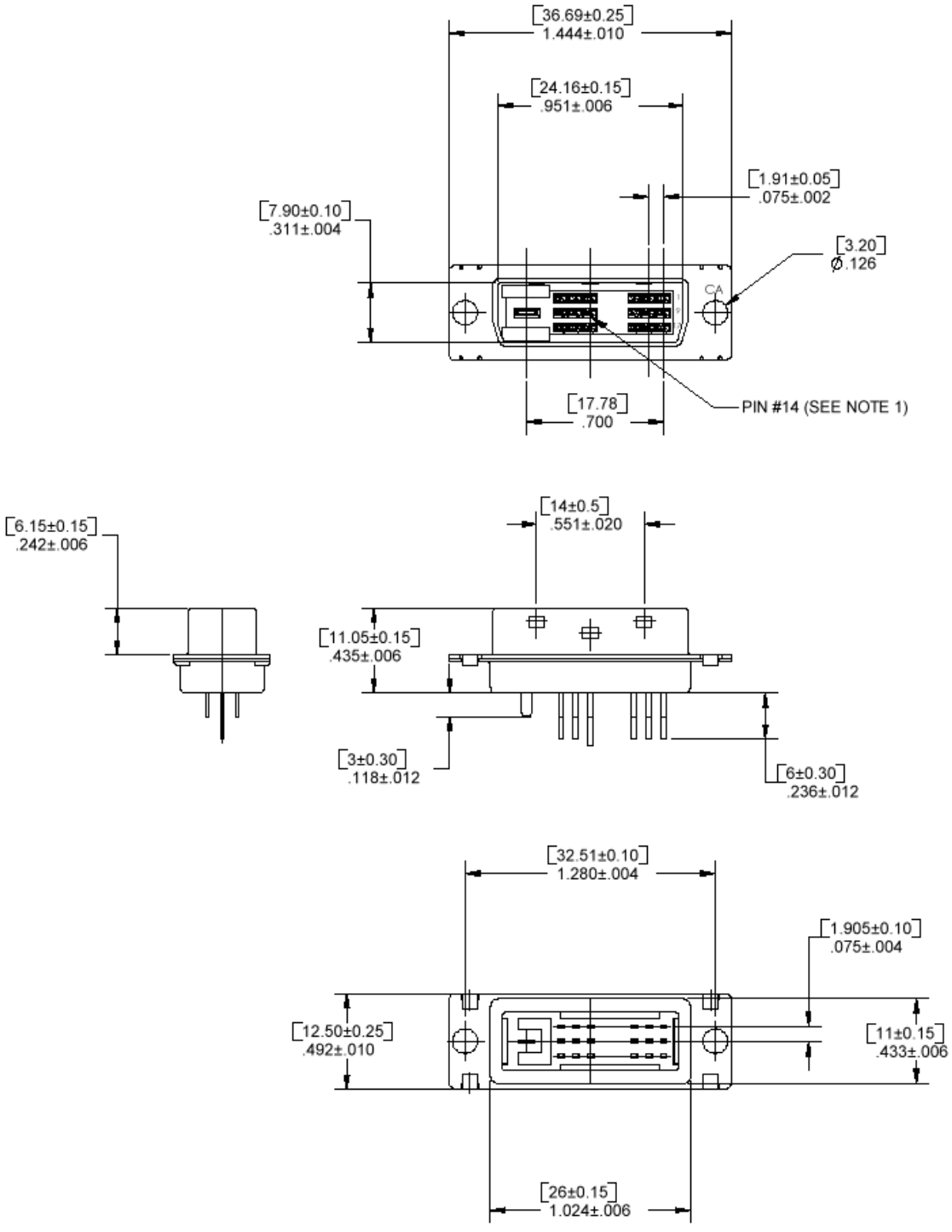
2.0 APPLICABLE DOCUMENTS

Reference documents listed below shall be the latest revision unless otherwise specified. Should a conflict occur between this specification and any of the listed documents then this specification shall prevail.

- VESA Plug and Display Standard
- Licensed under the DDWG, Digital Visual Interface Specification, 1.0 Adapter's Component
- Digital Visual Interface, DVI Revision 1.0, April 2, 1999
- ANSI/EIA-364 Standard
- CA-XXDVIPX-X (Male DVI Connector)
- CA-XXDVISX-X-X (Female DVI Connector)

SEE NEXT PAGES FOR DRAWINGS REFERENCES

CA – 18 DVI P D – X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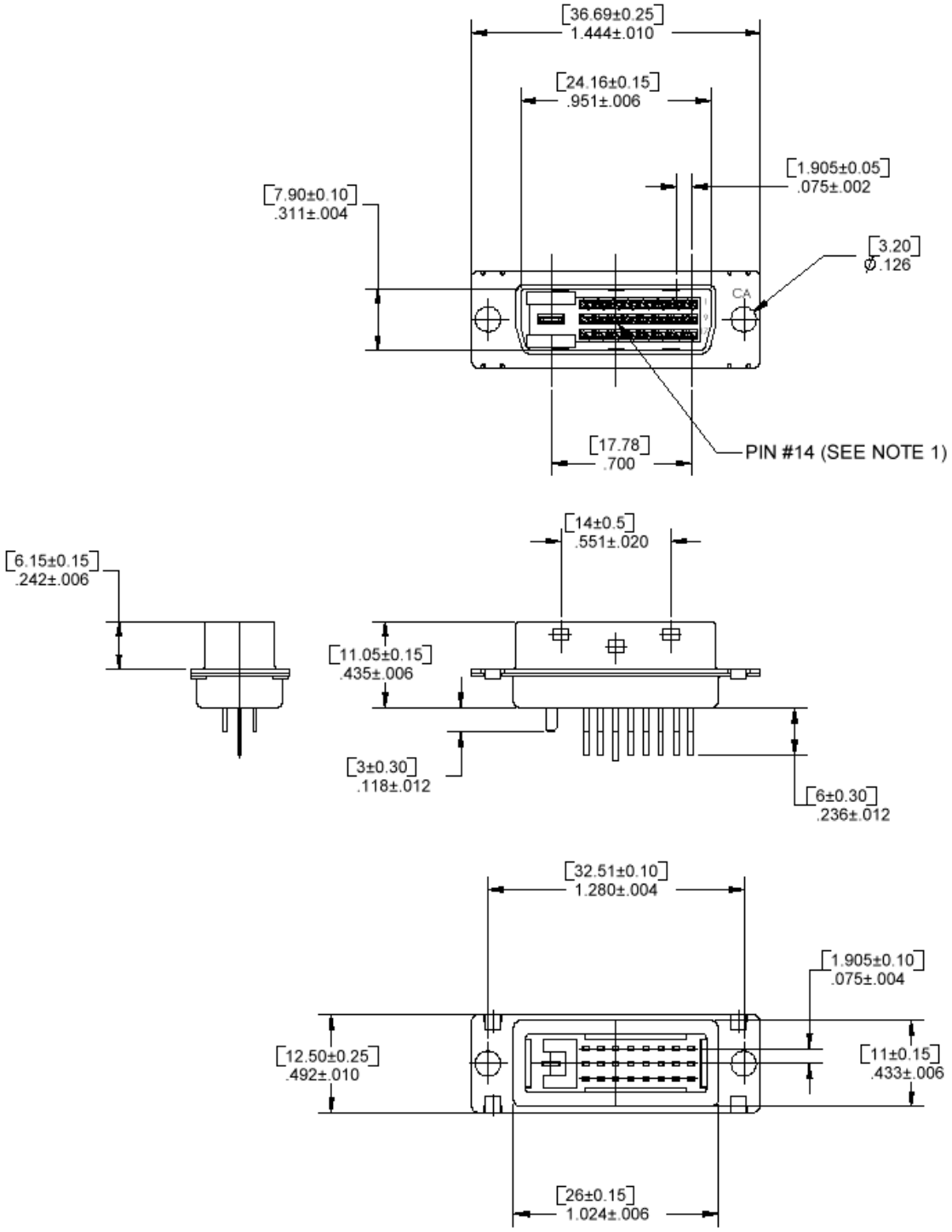
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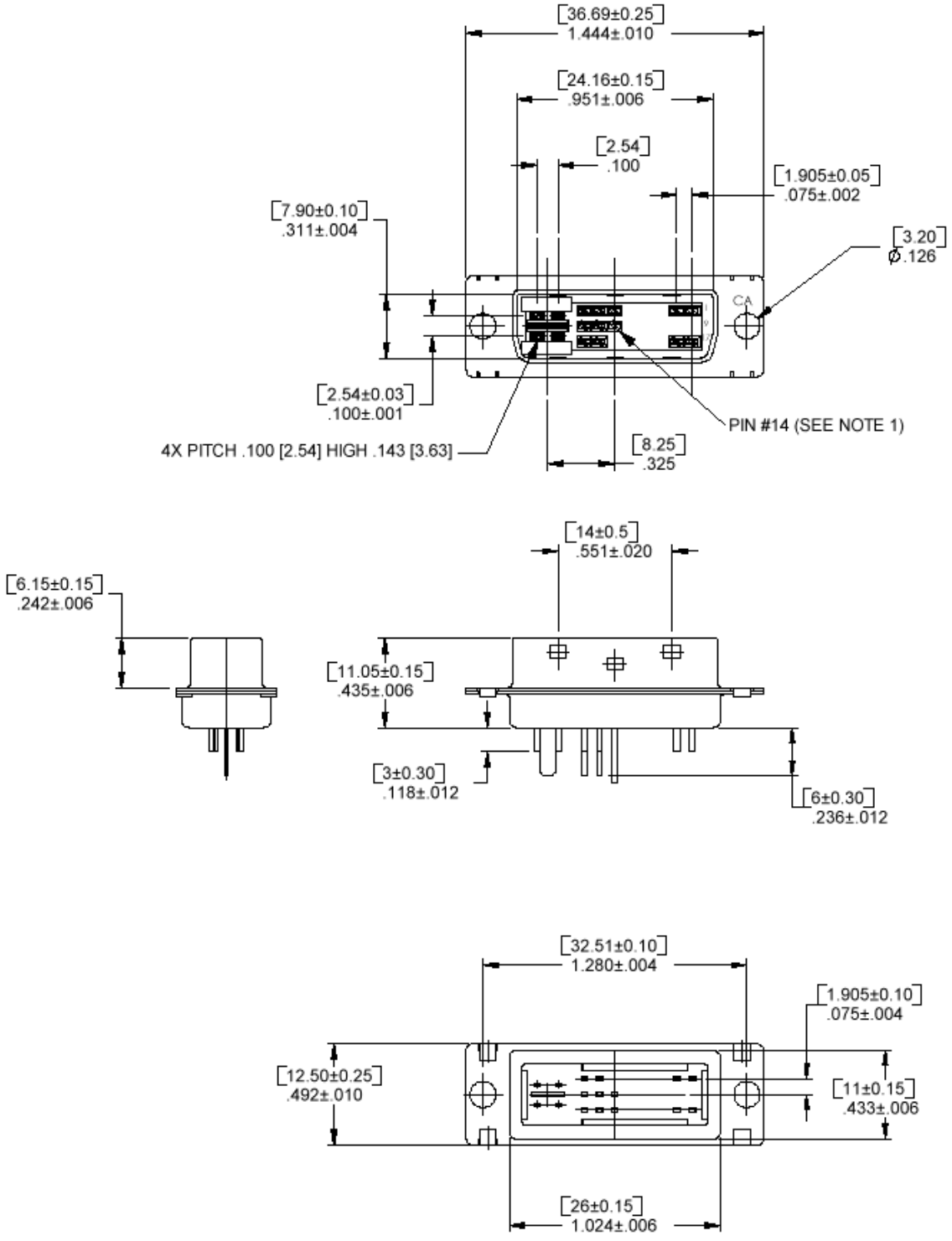
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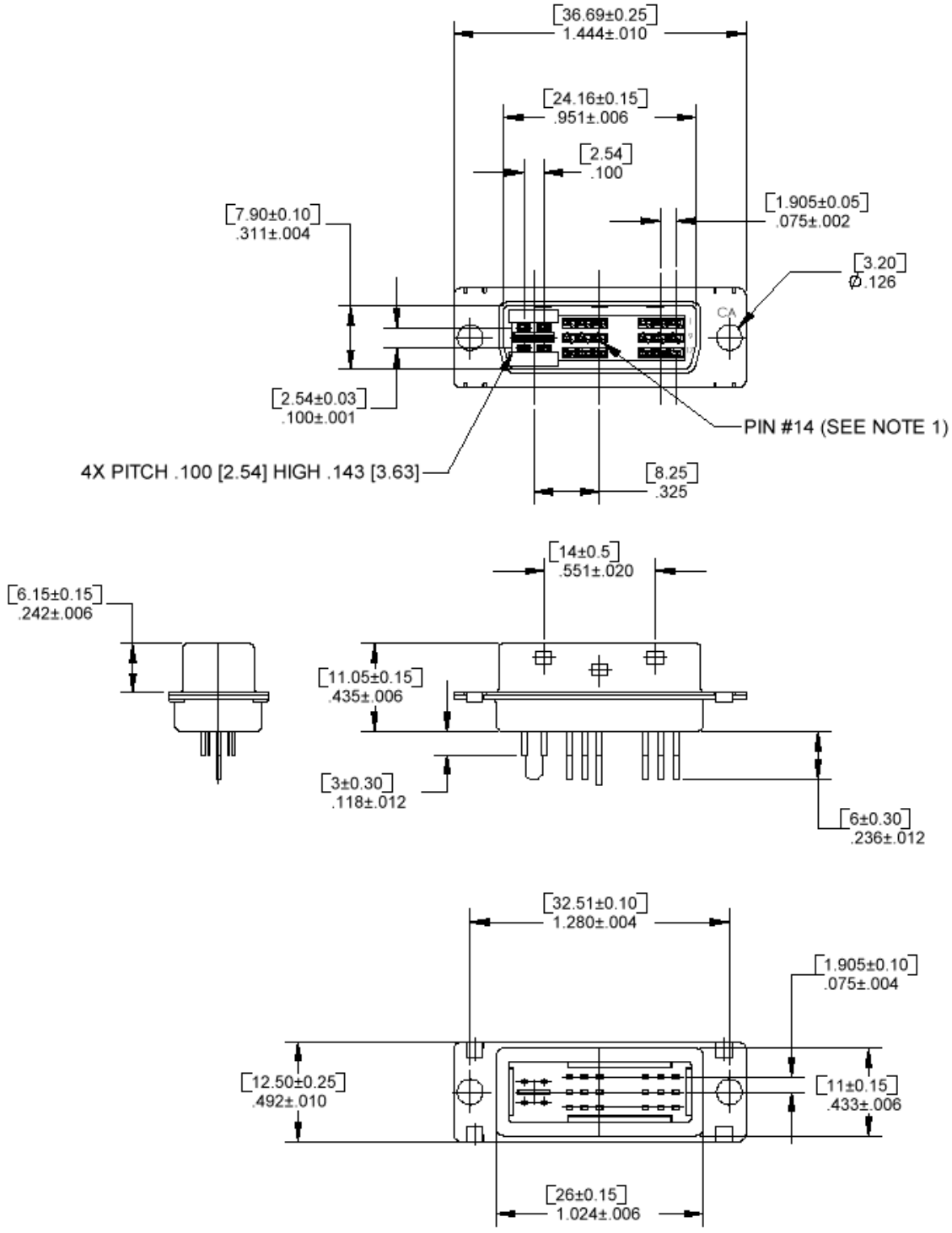
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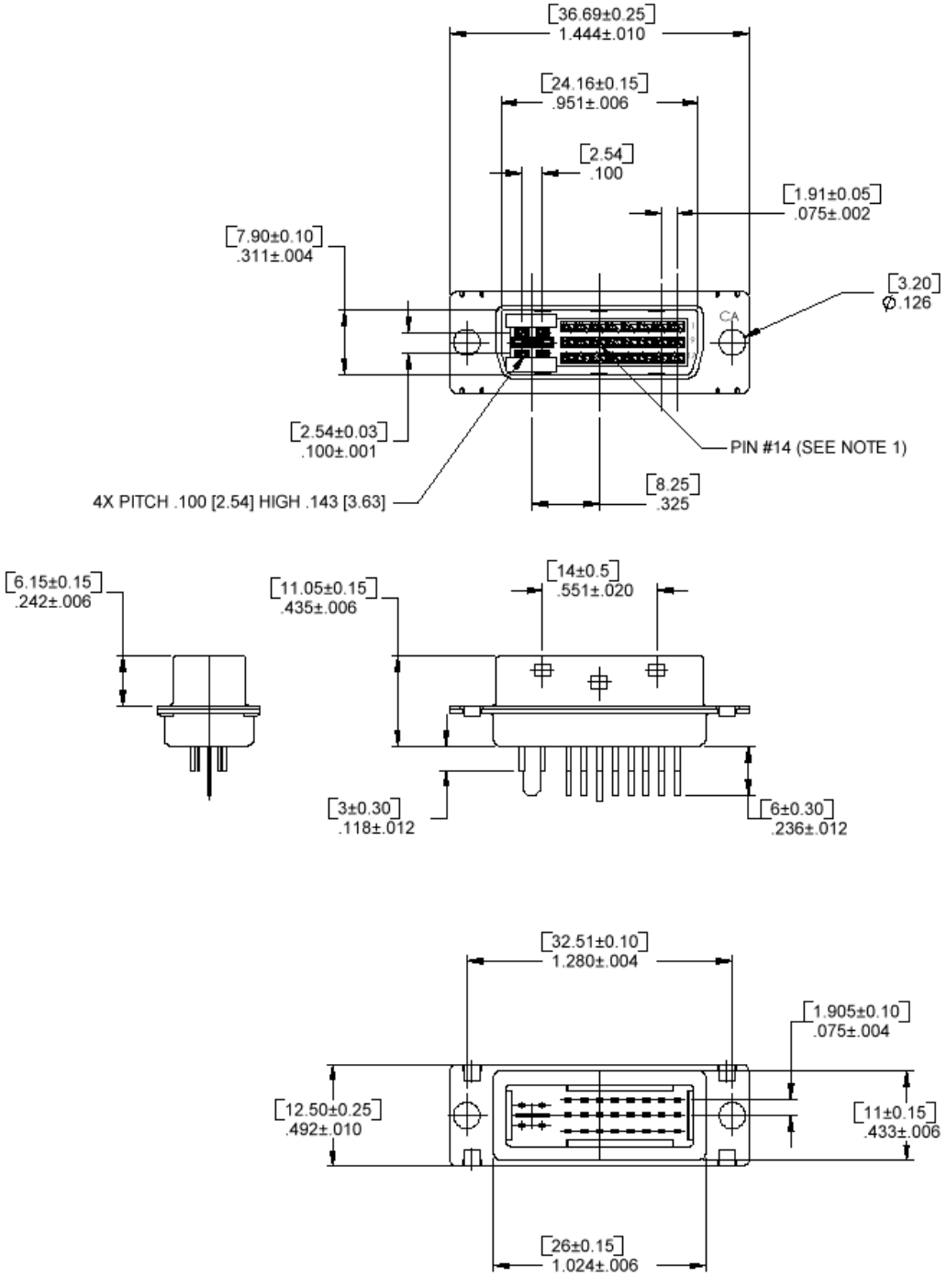
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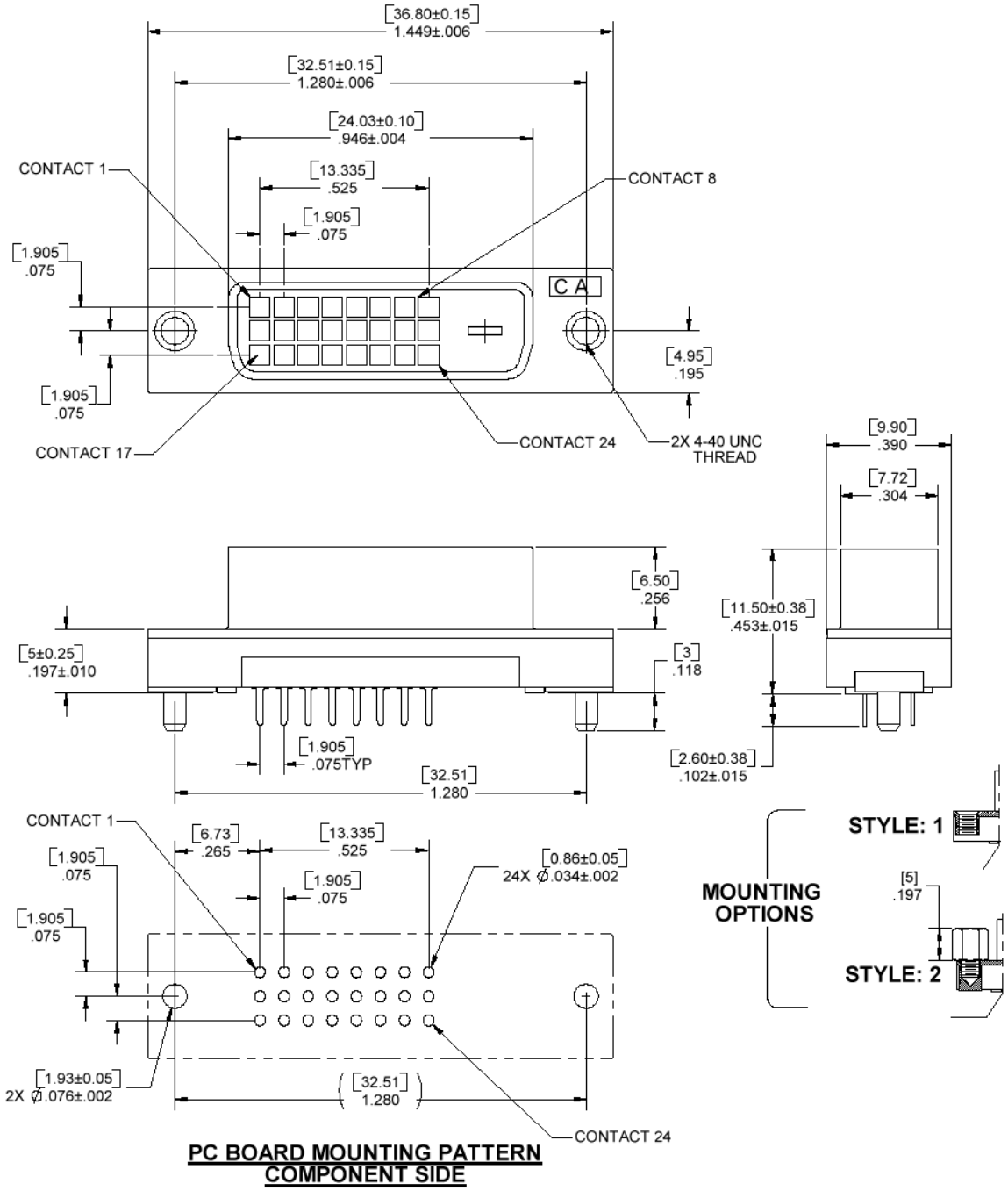
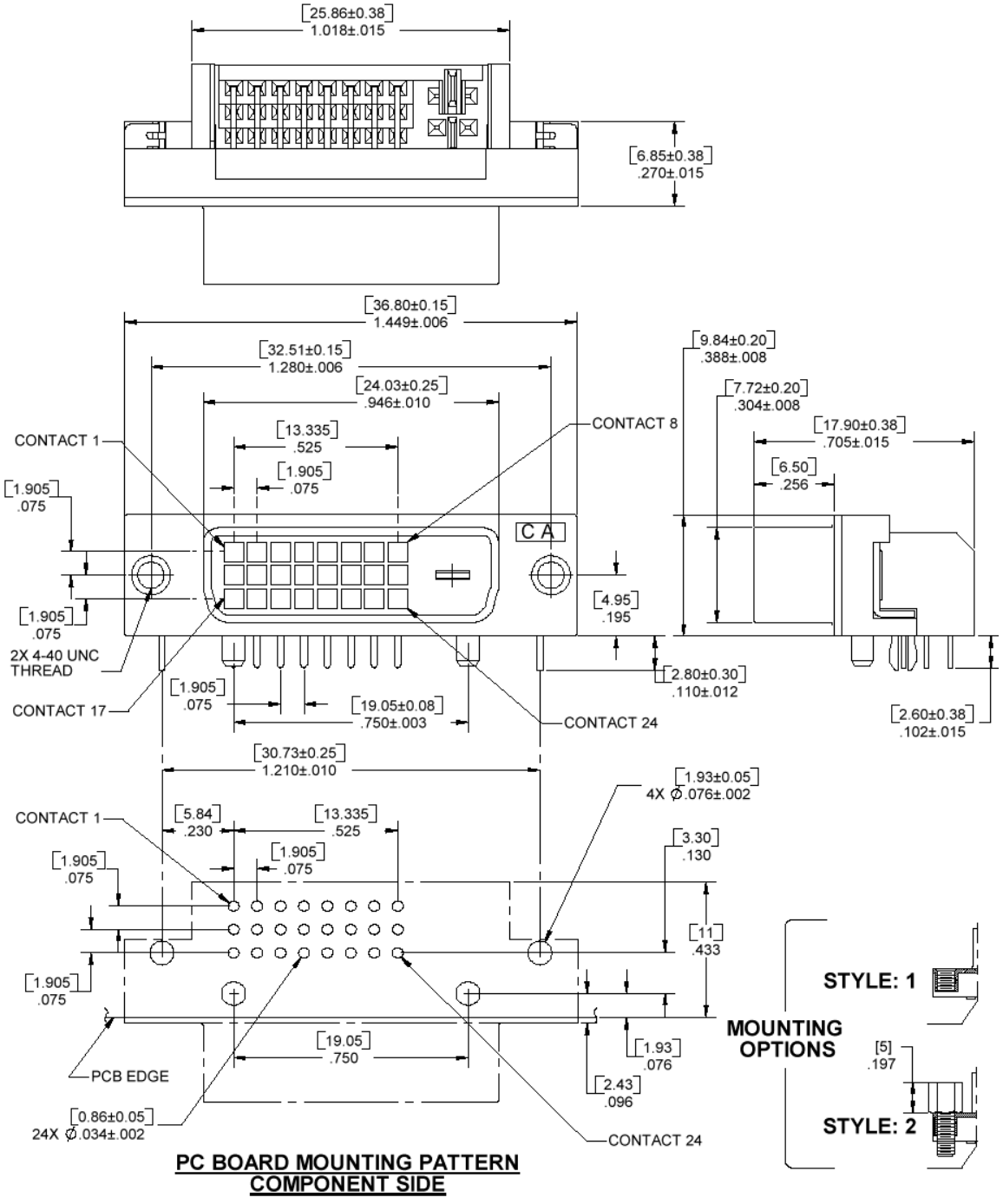
CA – 24 DVI S D V –X – X



PC BOARD MOUNTING PATTERN
COMPONENT SIDE

CA - 24 DVI S D R - X - X



PC BOARD MOUNTING PATTERN
COMPONENT SIDE

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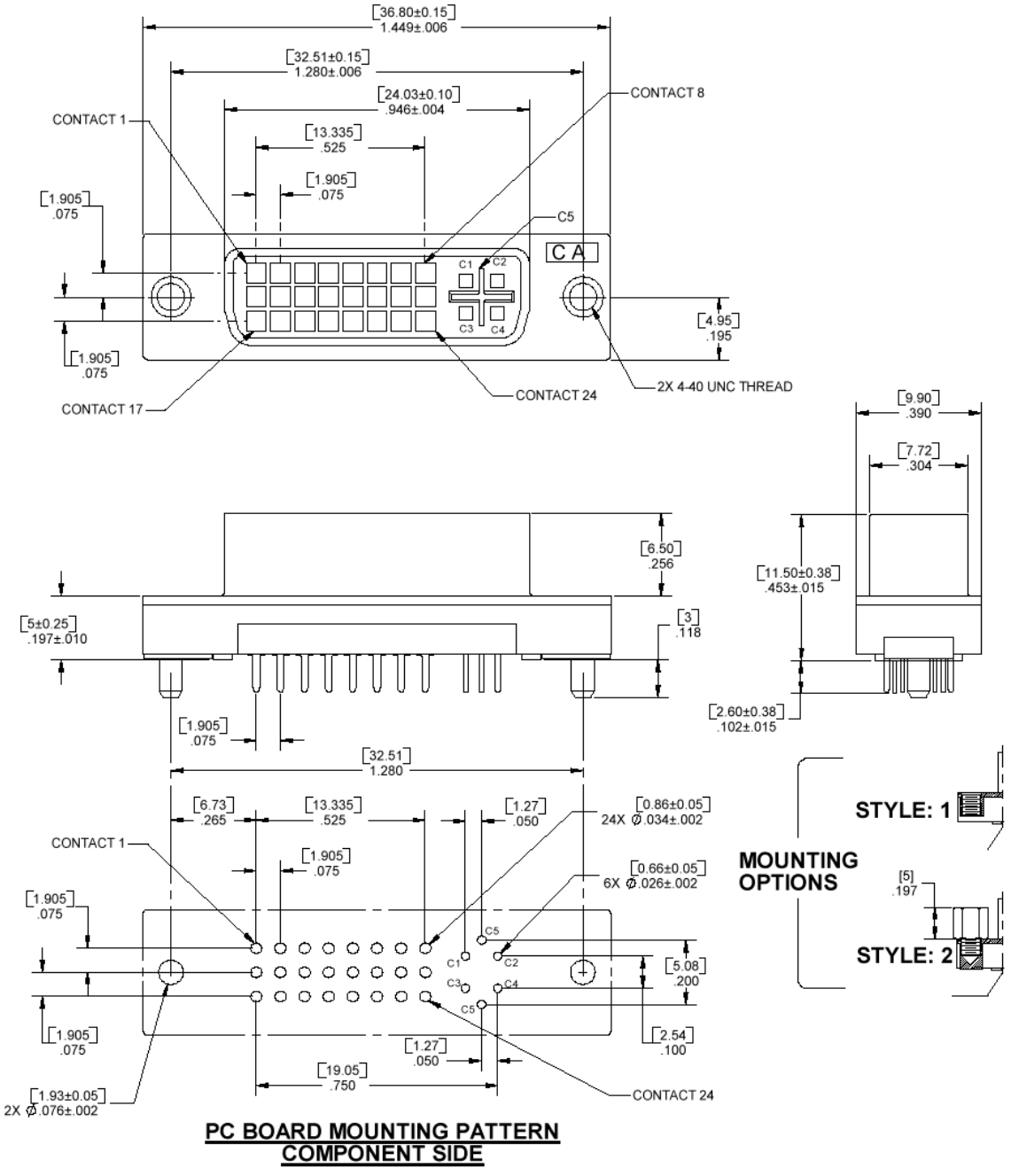
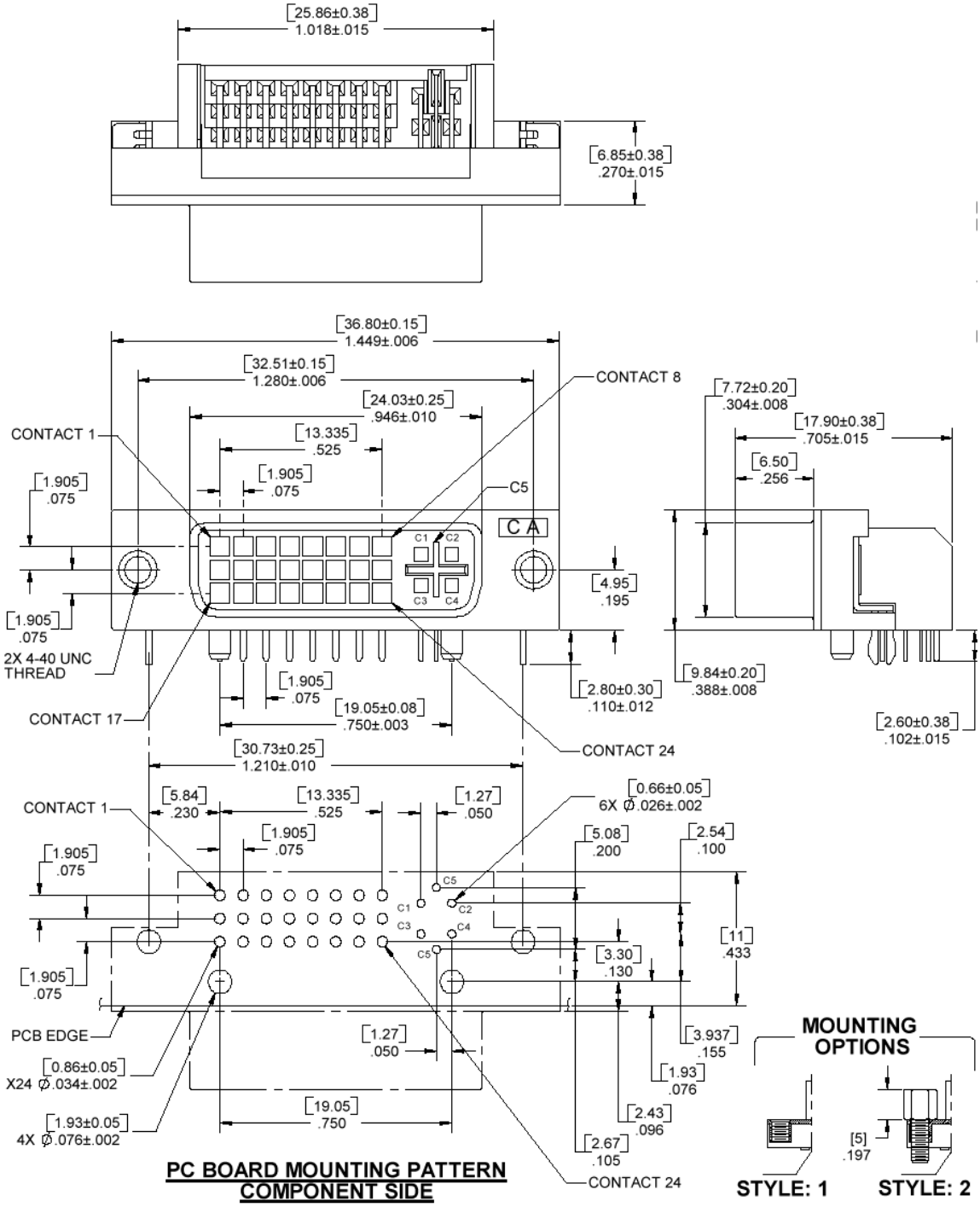


PC BOARD MOUNTING PATTERN
COMPONENT SIDE

CA - 29 DVI S I R - X - X



3.0 MATERIALS, ELECTRICAL AND ENVIRONMENTAL DESCRIPTION OF THE FEMALE DVI CONNECTOR:

3.1 Materials:

Housing: Glass Filled Thermoplastic, Black UL-94V-0
Contact: Phosphor Bronze
Shell: Zinc Alloy, Nickel plated
Contact plating: A = Gold flash over Nickel
C = .000015 [.00038] Gold over Nickel
F = .000030 [.00076] Gold over Nickel

3.2 Electrical:

Current Rating: 1.5 A @ 40VAC (rms)
Insulation Resistance: 1000 MΩ Minimum
Dielectric Withstanding Voltage: 500VDC
Contact Resistance: 20mΩ Maximum

3.3 Mechanical

Mating Force: 10 lb [4.5 Kg] maximum
Unmating Force: 2.2 lb [1 Kg] minimum
8.8 lb [4 Kg] maximum

3.4 Environmental:

Temperature Range: -55°C to +85°C

3.5 Product Number Description

CA- XX DVI S X X - X-X
1 2 3 4 5 6 7

1	POSITION 24 29	NUMBER OF PINS IN A CONNECTOR 24 + KEY DIGITAL 24 + 4 + 1 INTEGRATED: DIGITAL/ANALOG
2	SERIES	DIGITAL VISUAL INTERFACE
3	CONNECTOR TYPE	SOCKET
4	PRODUCT TYPE	**D** – DIGITAL **I** – INTEGRATED: DIGITAL/ANALOG
5	PROFILE	**R** – RIGHT ANGLE **V** – VERTICAL
6	PLATING CODE	**A** – GOLD FLASH OVER NICKEL **C** – GOLD OVER NICKEL .000015 [.00038] **F** – GOLD OVER NICKEL .000030 [.00076]
7	MOUNTING OPTION STYLES	**1 –** 4-40 UNC THREADED INSERT **2** – 4-40 UNC SCREWLOCK

3.6 Recognition and Certification
DVI socket connector series are recognized by Underwriters Laboratories, File No. E186513.

3.7 'RoHS' statement:
Meets the requirements of the European parliament and the restriction of the use of certain hazardous substances in electrical and electronic equipment. (RoHS)

4.0 MATERIALS, ELECTRICAL AND ENVIRONMENTAL DESCRIPTION OF THE MALE DVI CONNECTOR:

4.1 Material:
Housing: Glass Filled Thermoplastic, Black UL94V-0
Contact: Brass
Shell: Steel (Nickel plated)

4.2 Electrical:
Rated: 1.5A 40V (AC)
Contact Resistance: 20 mΩ Maximum
Insulation Resistance: 1000 MΩ Minimum,
Dielectric Withstanding Voltage: 500VDC

4.3 Mechanical:
Mating Force: 10 lb [4.5 Kg] maximum
Unmating Force: 2.2 lb [1 Kg] minimum
8.8 lb [4 Kg] maximum

4.4 Part Number Description

CA- XX DVI P X - X
1 2 3 4 5

1	POSITION 17 18 23 24 29	NUMBER OF PINS IN A CONNECTOR 12 +4 +1 ANALOG 18 + KEY DIGITAL, SINGLE LINK 18 + 4 + 1 INTEGRATED: DIGITAL/ANALOG 24 + KEY DIGITAL, DUAL LINK 24 + 4 + 1 INTEGRATED: DIGITAL/ANALOG
2	SERIES	DIGITAL VISUAL INTERFACE
3	CONNECTOR TYPE	PLUG
4	PRODUCT TYPE	**A** – ANALOG **D** – DIGITAL **I** – INTEGRATED: DIGITAL/ANALOG
5	PLATING CODE	**A** – GOLD FLASH OVER NICKEL **C** – GOLD OVER NICKEL .000015 [.00038] **F** – GOLD OVER NICKEL .000030 [.00076]

4.5 Recognition and Certification

DVI plug connector series are recognized by Underwriters Laboratories, File No. E186513.

4.6 Signal Pin Assignments

4.6.1 Digital-Only-Connector: The digital only connector contains 24 signal contacts organized in three rows of eight contacts. Signal pin assignments are listed in the following tables.

Table 4.6.1.1 Digital-Only Connector Pin Assignment

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data 2-	9	T.M.D.S. Data 1-	17	T.M.D.S. Data 0-
2	T.M.D.S. Data 2+	10	T.M.D.S. Data 1+	18	T.M.D.S. Data 0+
3	T.M.D.S. Data 2/4 Shield	11	T.M.D.S. Data 1/3 Shield	19	T.M.D.S. Data 0/5 Shield
4	T.M.D.S. Data 4-	12	T.M.D.S. Data 3-	20	T.M.D.S. Data 5-
5	T.M.D.S. Data 4+	13	T.M.D.S. Data 3+	21	T.M.D.S. Data 5+
6	DDC Clock	14	+5V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground (for +5V)	23	T.M.D.S. Clock+
8	No Connect	16	Hot Plug Detect	24	T.M.D.S. Clock-

4.6.2 Integrated Connector: The mechanical interconnect includes 29 signal contacts, which are divided into two sections. The first section is organized as three rows of eight contacts. The second section contains five signals that are designed specifically for analog video signals. Horizontal sync, Vertical sync, R, G, and B are all required for analog implementations. Signal pin assignments are listed in Table 4.5.2.1.

Table 4.6.2.1 Integrated and Digital Connector Pin Assignments

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data 2-	9	T.M.D.S. Data 1-	17	T.M.D.S. Data 0-
2	T.M.D.S. Data 2+	10	T.M.D.S. Data 1+	18	T.M.D.S. Data 0+
3	T.M.D.S. Data 2/4 Shield	11	T.M.D.S. Data 1/3 Shield	19	T.M.D.S. Data 0/5 Shield
4	T.M.D.S. Data 4-	12	T.M.D.S. Data 3-	20	T.M.D.S. Data 5-
5	T.M.D.S. Data 4+	13	T.M.D.S. Data 3+	21	T.M.D.S. Data 5+
6	DDC Clock	14	+5V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground (return for +5V, Hsync, and VSync)	23	T.M.D.S. Clock+
8	Analog Vertical Sync	16	Hot Plug Detect	24	T.M.D.S. Clock-
C1	Analog Red	C2	Analog Green	C3	Analog Blue
C4	Analog Horizontal Sync	C5	Analog Ground (analog R, G, & B return)		

4.6.2.2 Mating Contact Sequence

Connection	**Signal Pins**
First Make	Connector Shell
Second Make	C5 (analog ground, when present)
Third Make	Pins 1 through 13 and 15 through 24
Fourth Make	C1, C2, C3, C4 (analog signals, when present) Pin 14 (+5V power)

5.0 MECHANICAL PERFORMANCE

This section summarizes the mechanical performance requirements for the DVI connector interface. Where appropriate the relevant ANSI/EI-364 Test Procedures and Conditions are referenced.

Item	Test Condition	Requirement
Vibration	ANSI/EIA-364-28, Condition III Method 5A, 15 minute/axis	No discontinuity at 1 µs or longer (each contact) when continuity is tested per ANSI/EIA-364-46
Mechanical Shock	ANSI/EIA-364-27, Condition A (specified pulse)	No discontinuity at 1 µs or longer (each contact) when continuity is tested per ANSI/EIA-364-46
Durability	ANSI/EIA-364-09 Automatic cycling to 100 cycles Rate: 100 ± 50 cycles per hour	Low Level contact resistance per ANSI/EIA-364-23 10 mΩ maximum change from initial per contact pair All samples to be mated
Mating & Un-mating Forces	ANSI/EIA-364-13 Insert and extract at a speed of 25mm/minute	Un-mating force: 1 kg force minimum, 4 kg force maximum Mating force: 4.5 kg force maximum
Cable Flexing	ANSI/EIA-364-41 Condition I Dimension X=3.7 x cable diameter 100 cycles in each of 2 planes	Dielectric Withstanding Voltage tested per requirements of section 5.3. Insulation Resistance tested per requirements of section 5.3 Continuity tests per ANSI/EIA-364-46 with no discontinuities on contacts or shield greater than 1 µs allowed during flexing

6.0 ELECTRICAL CHARACTERISTICS

Connector Electrical Performance: This section summarizes the electrical performance requirements for the DVI connector interface. Where appropriate the relevant ANSI/EIA-364 Test Procedures and Conditions are referenced.

Item	Test Condition	Requirement
Contact Resistance	ANSI/EIA-364-23	20 mΩ, maximum, initial per contact mated pair. 10 mΩ, maximum change from original per contact mated pair
Shell Resistance	ANSI/EIA-364-06A-83 Contact resistance measured from receptacle shell leg to plug cable braid. Test current = 100mA; Test voltage = 5V DC open circuit maximum	50 mΩ, maximum initial 50 mΩ, maximum change from original
Dielectric Withstanding Voltage	ANSI/EIA-364-20 Test voltage 500 V DC ± 50V Method C, unmated and unmounted Barometric pressure of 15 psi	No flashover, No sparkover, No excess leakage, No breakdown
Insulation Resistance	ANSI/EIA-364-21 Test voltage 500 V DC ± 50V Method C, unmated and unmounted	1GΩ minimum between adjacent contacts and contacts and shell
Contact Current Rating	ANSI/EIA-364-70, TP-70 55°C, maximum ambient 85°C, maximum temperature change	1.5 A minimum
Applied Voltage Rating		40 Volts AC (rms) continuous maximum, on any signal pin with respect to the shield
Electrostatic Discharge	IEC 801-2 Test unmated from 1 kV to 8 kV in 1 kV steps using 8 mm ball probe	No evidence of discharge to contacts. Discharge to the shell is acceptable

Item	Test Condition	Requirement
T.M.D.S. Signal Time Domain Impedance	ANSI/EIA-364-108 Draft Proposal Risetime = 330 pS (10%-90%) S:G ratio per DVI pin designation Differential Measurement Specimen Environment Impedance = 100 Ω differential Source-side receptacle connector mounted on a controlled impedance PCB fixture	100 Ω ± 15%
T.M.D.S. Signal Time Domain Crosstalk: FEXT	ANSI/EIA-364-90 Draft Proposal Risetime = 330 pS (10%-90%) S:G ratio per DVIA pin designation Differential Measurement Specimen Environment Impedance = 100 Ω differential Source-side receptacle and the load side plug connector are mounted on a controlled impedance PCB fixture. (1) Driven pair and (1) victim pair	5% Maximum
T.M.D.S. Signal Rise Time	ASNSI/EIA-364-102 S:G ratio per DVI pin designation Differential Measurement	160 pS Maximum (Note:

Degradation	Specimen Environment Impedance = 100 Ω differential Source-side receptacle and the load side plug connector Mounted are on a controlled impedance PCB fixture	Converted bandwidth using $BW=0.35/t_{rise}$ yields 2.2 GHz)

Item	Test Condition	Requirement
Analog RGB Coaxial Signal Time Domain Impedance	ANSI/EIA-364-108 Draft Proposal Risetime = 700 pS (10%-90%) S:G ratio per DVI pin designation Single-ended Measurement Specimen Environment Impedance = 75 Ω single-ended Source-side receptacle connector is mounted on a controlled impedance PCB.	75 Ω ± 10%
Analog RGB Coaxial Signal time Domain Crosstalk: FEXT	ANSI/EIA-364-90 Draft Proposal Risetime = 700 pS (10%-90%) S:G ratio per DVI pin designation Single-ended Measurement Specimen Environment Impedance = 75 Ω single-ended Source-side receptacle connector is mounted on a controlled impedance PCB fixture and the load side plug connector is terminated to semi-rigid coax. (1) driven line and (1) victim line	3% Maximum
Analog RGB Coaxial Signal Rise Time **Degradation**	ANSI/EIA-364-102 S:G ratio per DVI pin designation Single-ended Measurement Specimen Environment Impedance = 75 Ω single-ended Source-side receptacle connector is mounted on a controlled impedance PCB fixture and the load side plug connector is terminated to semi-rigid coax.	140 pS Maximum (Note: Converted bandwidth using $BW=0.35/t_{rise}$ yields 2.5 GHz)

7.0 CABLE ELECTRICAL PERFORMANCE

This section summarizes the electrical performance requirements for coaxial cable used in the DVI cable assembly.

Item	Test Condition	Requirement
Analog RGB Signal Conductor Impedance		75Ω ± 4Ω
Analog RGB Signal Conductor DC Resistance	At 20°C	1.8Ω Maximum
Analog RGB Signal Attenuation	Frequency (MHz) 1 10 50 100 200 400 700 1000	 0.14 dB Maximum 0.45 dB Maximum 1.0 dB Maximum 1.5 dB Maximum 2.1 dB Maximum 3.0 dB Maximum 4.3 dB Maximum 5.4 dB Maximum

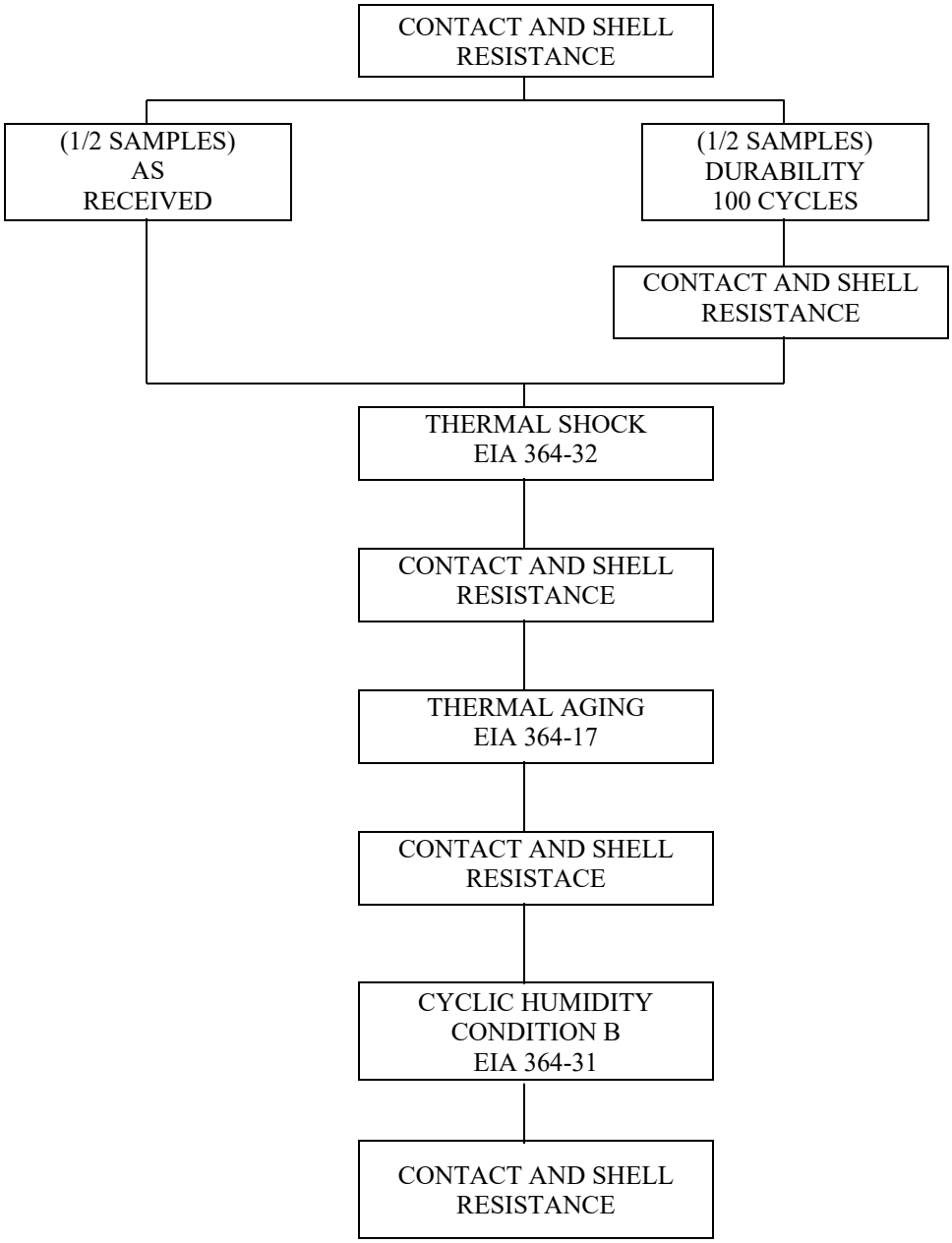
8.0 ENVIRONMENTAL CHARACTERISTICS

This section summarizes the environmental performance requirements for the DVI connector interface. Where appropriate the relevant ANSI/EIA-364 Test Procedures and Conditions are referenced.

Item	Test Condition	Requirement
Thermal Shock	ANSI/EIA-364-32, Condition I 10 cycles, mated	Low Level contact resistance per ANSI/EIA-364-23 10 mΩ maximum change from initial per contact pair All samples to be mated
Cyclic Humidity	ANSI/EIA-364-31, Conditions A and B Method III, omit 7A and 7B	Low Level contact resistance per ANSI/EIA-364-23 10 mΩ maximum change from initial per contact pair All samples to be mated
Temperature Life	ANSI/EIA-354-17 Condition 4 105° C for 250 hours Method A, mated	Low Level contact resistance per ANSI/EIA-364-23 10 mΩ maximum change from initial per contact pair All samples to be mated
Temperature Rating	Operating	-20 °C to + 85 °C
Temperature Rating	Non-Operating	-20 °C to + 85 °C

9.0 TEST SEQUENCES:

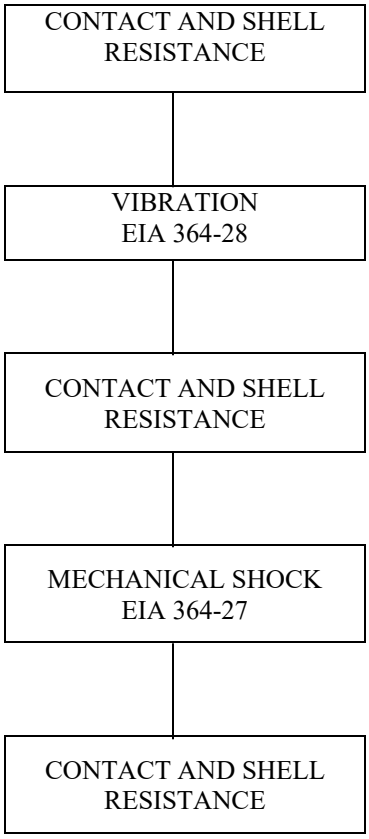
9.1 Group I: Mated Environmental



Number of Samples:

(5) Receptacles assembled to printed circuit board
(5) Cable assemblies with a plug assembled to one end, 25.4 cm long

9.2 Group II: Mated Mechanical

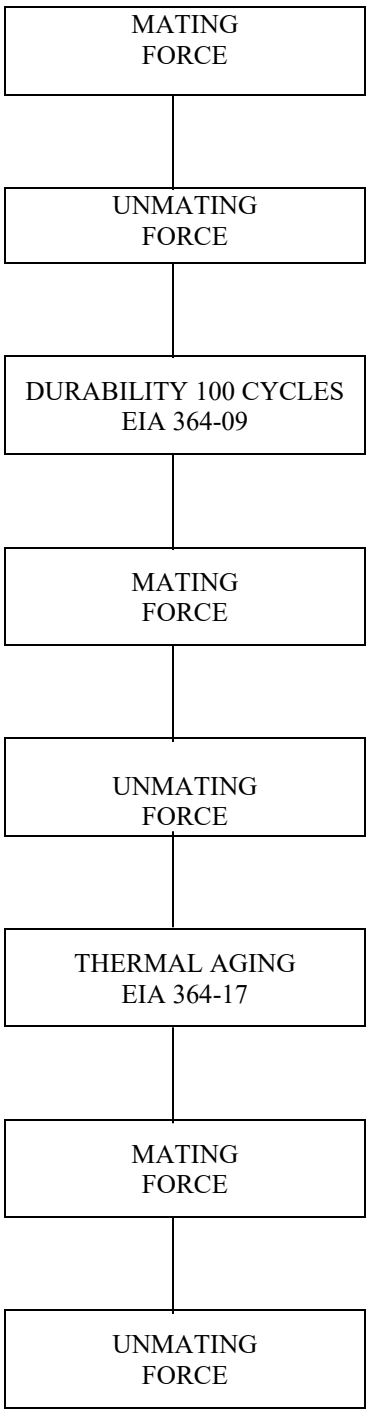


Number of Samples:

(2) Receptacles, assembled to printed circuit board
(2) Cable assemblies with a plug assembled to one end, 25.4 cm long

Note: connector is to be mounted on a fixture that simulates the typical application. The receptacle connector shall be mounted to a panel, per the receptacle panel cutout as shown in the DDWG specification, figure 5-7, page 55 which is permanently affixed to the fixture. The plug shall be mated to the receptacle with jackscrews fully engaged and the other end of the cable shall be permanently clamped to the fixture.

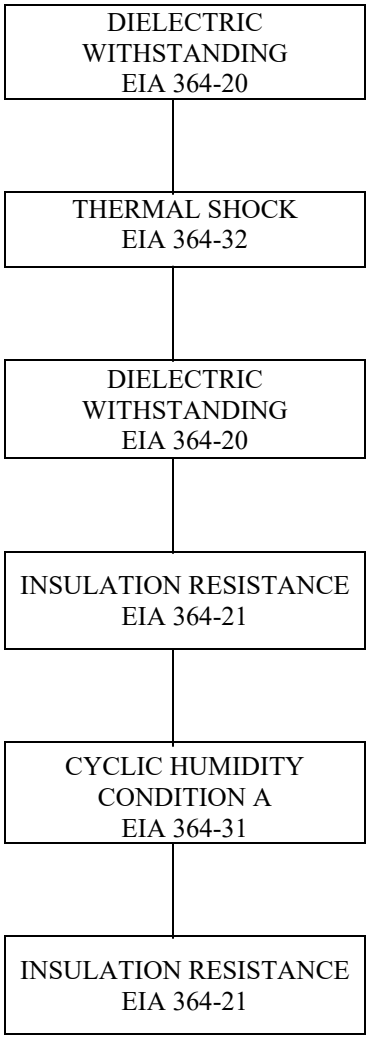
9.3 Group III: Mechanical Mate/Un-mate Forces



Number of Samples:

(2) Receptacles, assembled to printed circuit board
(2) Cable assemblies with a plug assembled to one end, 25.4 cm long

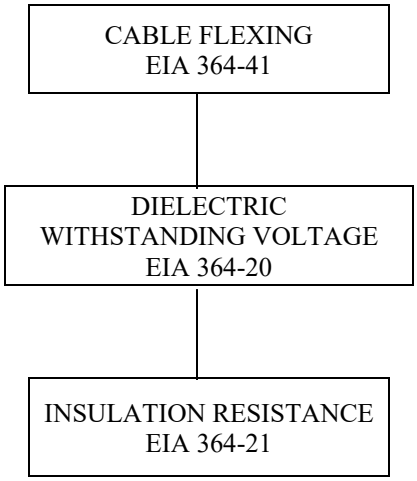
9.4 Group IV: Insulator Integrity



Number of Samples:

(2) Receptacles, assembled to printed circuit board
(2) Cable assemblies with a plug assembled to one end, 25.4 cm long

9.5 Group V: Cable Flexing



Number of Samples:

(2) Cable assemblies

9.6 Group VI: Electrostatic Discharge

Number of Samples:

(1) Receptacle connector

Initiated By:	Date:	Engineering Approval:	Date:	Quality Approval:	Date:
Carmen C. Lowy	7/20/01		7-20-01		7-20-01

REV.	DESCRIPTION	DATE	INITIALS
A	INITIAL RELEASE, SEE DO NO. 3894	2/28/00	C. C.
B	SEE DO NO. 3996	4/25/00	C.C.
C	SEE DO NO. 4563	7/20/01	C.C.L
D	SEE DO NO. 4713	12/11/01	C.C.L
E	SEE DO NO. 7611	04/01/2021	T.C.