ZEBRA® Elastomeric Connectors

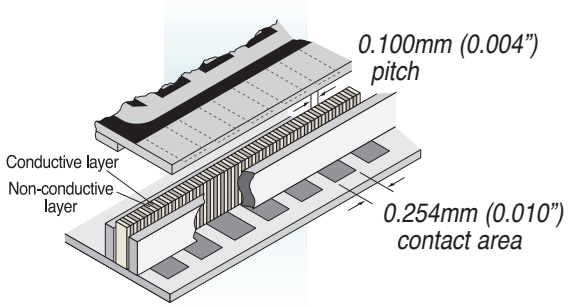
ZEBRA® Elastomeric Electronic Connectors are a comprehensive group of high performance interconnect devices with applications throughout the entire field of electronics.

With the expansion of micro-electronics and miniaturization of all products, the same high reliability must be maintained.

ZEBRA® Elastomeric Connectors are an obvious choice and one which offers a variety of alternatives based on the primary design objectives. Some of the more important considerations are:

- ***High Density, increased number of I/O's***
- ***Low resistance, high current capacity***
- ***Low insertion force, low compression force***
- ***Redundant contact engagement***
- ***High electrical and mechanical reliability***
- ***Chemical stability, degradation resistance***
- ***Cost-effectiveness, ease of assembly***

ZEBRA® Elastomeric Connectors have alternating conductive and non-conductive layers. See diagram below. The conductive layers are oriented vertically in the thickness direction, making contact from top to bottom.

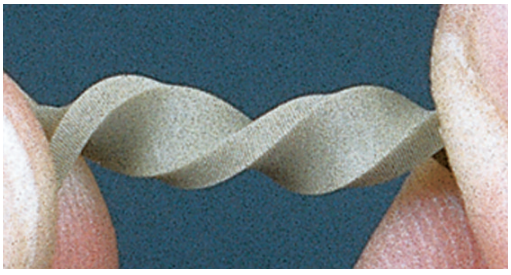


Typical ZEBRA® Connector interface between two contact areas; such as, PCB to LCD, or PCB to PCB.

All styles offer redundant contact depending on the pitch of the conductive layers, some as small as 0.05 mm centerline (see drawing above).

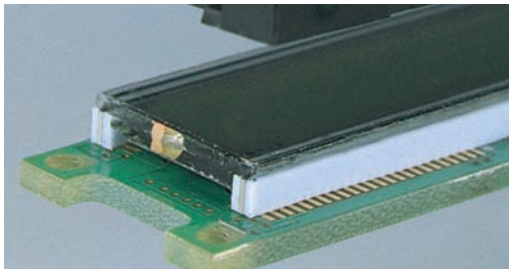
APPLICATIONS:

- *LCD and EL displays*
- *Board-to-board*
- *Chip-to-board*
- *Memory cards*
- *Flex circuit-to-board*
- *Burn-in sockets*
- *Miniature and low profile interconnect - general electronics*

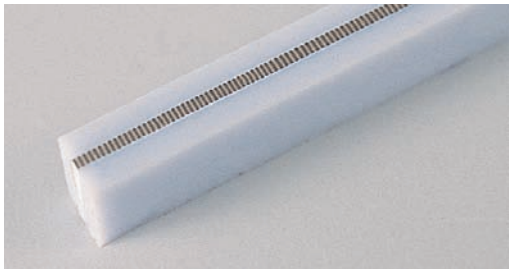


High strength bonding unitizes layers into one rugged body.

Each of the styles is also available with outer support sections along the entire length on one or both sides (except Series 8000). The support is available in sponge or solid silicone rubber, and creates a larger width area. This eliminates the need for a holder while still allowing a very low compression force during deflection. For optional ordering information, see instructions on page 6 under "Self -Supported Connectors".



ZEBRA® Silver Connector in medical instrument display.



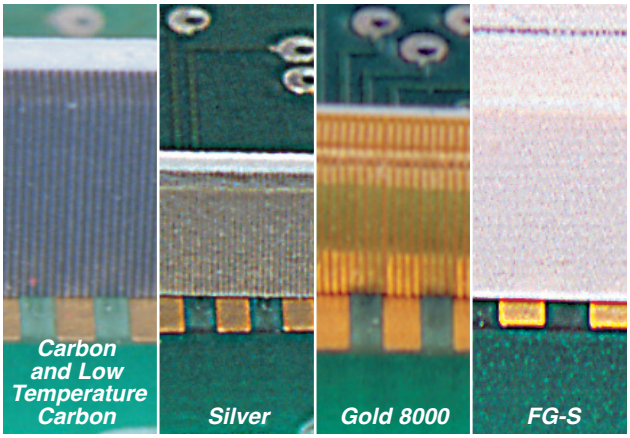
Typical ZEBRA® Connector with optional silicone rubber self-support sections on each side.

All dimensions in millimeters and inches

ZEBRA® CONNECTOR TECHNICAL DATA

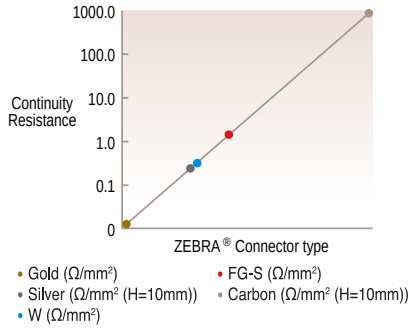
The five ZEBRA® Elastomeric Connector designs below are detailed in their dimensional and performance characteristics. Follow the general guidelines to determine the design characteristics most suitable for your application. See following pages for detailed characteristics.

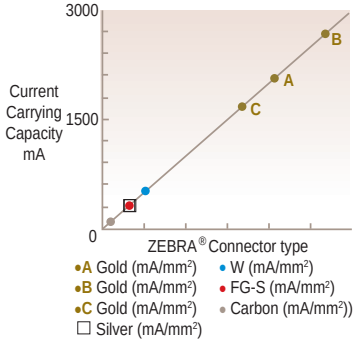
The photo enlargements at right demonstrate the multiple contact points per circuit conductor pad for typical ZEBRA® connector designs.



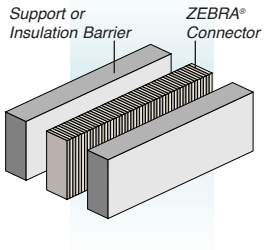
Name	Application Guidelines	Typical Products
Carbon	Economical general use with contact pitches at 140, 240 or 500 per inch	LCD's for aerospace, aircraft, military, meters, instruments, cameras
Low Temperature Carbon	Low temperature, outdoor applications, specifications as low as -60ºC with contact pitches at 240 per inch	
Silver	300mA current carrying capacity, rugged long-life aging with contact pitches at 240 per inch	
Gold 8000	Zero insertion force, tight pitch, low compression force, very low resistance, very high current carrying capacity; contact pitches at 100, 133, 166 per inch	Electroluminescent displays, component-to-board, burn-in sockets, PCB to PCB, chip on glass, LCD's, chip on foil, COF's
FG-S	Zero insertion force, very low compression force, low resistance, high current carrying capacity, 240 gold-plated contacts per inch in a single row	

TYPICAL PERFORMANCE CHARACTERISTICS:





SIDE SUPPORT or INSULATION BARRIER:



Drawing at left shows side support or insulation on one or both sides, or one of each.

Various materials are available from the minimum insulating barrier of 0.05mm to support layers of up to 1.5mm. Support layers can be soft silicone rubber, or medium and soft silicone sponge. Recommended height is twice the width for minimum force deflection.

See page 6 for details. Consult customer service for ordering specifications.

Part Number Nomenclature:

To specify a connector to your exact requirements, substitute the metric measurements for width, length and height according to instructions below; example part# Ag(2.0 IB1 x 20 x 2.0)-U; ***Note: For Carbon Zebra, make sure to advise pitch desired.***

ZEBRA® Ag (2.0 – IB1 x 20 x 2.0)

- *Height*
- *Length*
- *Insulation Barrier or Solid Support (if required)*
  - *LT, CA, Ag only*
    - *IB1 0.05mm Insulation barrier 1 side only*
    - *IB2 0.05mm Insulation barrier 2 sides*
    - *SS1 Solid Support 1 side only (specify ZEBRA® thickness; i.e., SS1-1.5)*
    - *SS2 Solid Support 2 sides (specify ZEBRA® thickness; i.e., SS2-1.5)*
    - *SPG Sponge Support 2 sides (see standards page 6)*
  - *Au only: Wire Pitch (Insulation Barrier component not needed for Au)*
    - *Au-A 0.25mm (0.010") wire pitch*
    - *Au-B 0.19mm (0.0075") wire pitch*
    - *Au-C 0.15mm (0.006") wire pitch*
- *Width*
- *ZEBRA® series: • FG-S for single contact row • LT for Low Temperature Carbon • CA for Carbon • Ag for Silver • Au for Gold*

All dimensions in millimeters

ZEBRA® Elastomeric Connectors

ZEBRA® CARBON and LOW TEMPERATURE CARBON CONNECTORS

FUJIPOLY ZEBRA® connectors (see figure 1) have alternating layers of conductive carbon-filled and non-conductive silicone rubber. They make reliable connections by being deflected between contacting surfaces. ZEBRA® connectors are used for connecting any LCD from small displays for watches to large area displays for instruments. Table A shows the different types of ZEBRA® connectors available. Table C shows performance characteristics.

Figure 1 shows the three dimensions of the ZEBRA® connector. When ordering, the three dimensions should be specified within the limits shown in table B.

For best overall performance, ZEBRA® connectors must be ordered and used with a ratio of H/W equal to or greater than 1.5.

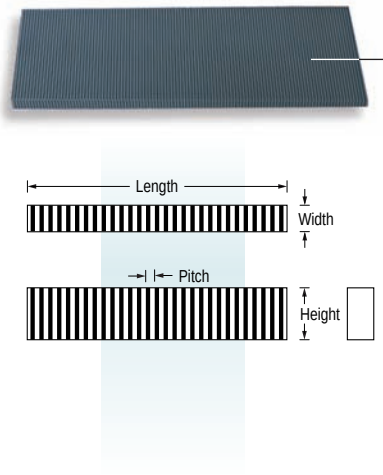


Figure 1

Series	LCD Contact Spacing Center-to-Center Minimum	Pitch: Sum of the Thickness of an Adjacent Conductive and Non-conductive Layer Nominal	Pitch: Sum of the Thickness of an Adjacent Conductive and Non-conductive Layer Maximum	Conductive Layers per inch Minimum	Individual Conductive and Insulating Layer Thickness Minimum	Individual Conductive and Insulating Layer Thickness Maximum	Available Lengths Maximum
1002 (CZ410/CZ710)	0.015 in. 0.38 mm	0.004 in. 0.10 mm	0.006 in. 0.15 mm	240	0.001 in 0.025 mm	0.004 in. 0.10 mm	9.0 in. 230 mm
2004 (CZ418)	0.020 in. 0.50 mm	0.007 in. 0.18mm	0.010 in. 0.25 mm	140	0.002 in. 0.050 mm	0.006 in. 0.15 mm	9.0 in. 230 mm
2005 (CZ405/CZ705)	0.010 in. 0.25 mm	0.002 in. 0.050 mm	0.004 in. 0.10 mm	500	0.0004 in. 0.010 mm	0.0024 in. 0.060 mm	9.0 in. 230 mm
LT 200 (CZ610)	0.015 in. 0.38 mm	0.004 in. 0.10 mm	0.006 in. 0.15 mm	240	0.001 in. 0.025 mm	0.004 in. 0.10 mm	5.0 in. 127 mm

TABLE A

Measurement	Tolerance (inches/mm)
Length=L	0.157 in. to 2.40 in. — ± 0.008 in. ····/···· 4.00 mm to 61.00 mm — ± 0.20 mm 2.410 in. to 6.00 in. — ± 0.015 in. ····/···· 61.2 mm to 152.4 mm — ± 0.38 mm 6.010 in. to 7.87 in. — ± 0.020 in. ····/···· 152.6 mm to 200.0 mm — ± 0.50 mm 7.880 in. to 9.00 in. — ± 0.039 in. ····/···· 200.1 mm to 230.0 mm — ± 1.00 mm
Height=H	0.020 in. to 0.750 in. ± 0.005 in. ····/···· 0.50 mm to 19mm ± 0.127 mm above 0.750 in/19.0 mm consult factory
Width=W	0.015 in. to 0.039 in. — ± 0.002 in.····/···· 0.38 mm to 1.0 mm — ± 0.050 mm 0.040 in. to 0.079 in. — ± 0.003 in.····/···· 1.01 mm to 2.0 mm — ± 0.076 mm 0.080 in. to 0.118 in. — ± 0.005 in.····/···· 2.01 mm to 3.0 mm — ± 0.127 mm above 0.118 in./3.00 mm consult factory.

TABLE B

ZEBRA® Connectors	Temperature Range Minimum	Temperature Range Maximum	Current Carrying Capacity 0.040" x 0.040" pad	Resistance Between Layers
Carbon	-40°F -40°C	212°F 100°C	0.005 amps	10^{12} ohms
Low Temperature LT 200	-85°F -65°C	260°F 125°C	0.005 amps	10^{12} ohms

TABLE C

All dimensions in inches and millimeters

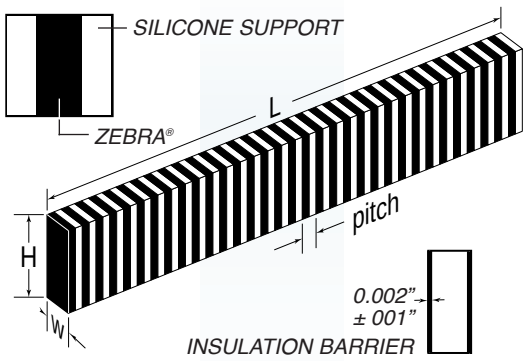


Figure 2 Recommended Height (H) should be 1.5 x Width (W) dimension for minimum force deflection. Maximum Skewness 2% of Height.

ZEBRA® CONNECTOR DIMENSIONS

Figure 2 shows the three dimensions of the ZEBRA® connector. When ordering, the three dimensions should be specified within the limits shown in Table B. For best overall performance, ZEBRA® connectors must be ordered and used with a ratio of H/W equal to or greater than 1.5. Details show silicone support (left) and insulation barrier (right). Each is available on one or both sides. Configurations may also include support on one side and insulation on the other.

ZEBRA® CONNECTOR INSULATING BARRIER

Description	Insulating Barrier
Color (one only)	White
Hardness, Durometer A	30
Dielectric Strength volts/mil.	500
Resistance, ohms	10^{12}
Insulating Barrier Width (B) in.*	0.002 ± 0.001
(B) mm	0.050 ± 0.025

TABLE D *The tolerance of W_1 is equal to the sum of the tolerances of W.

NOMINAL RESISTANCE CALCULATION

To calculate the resistance of the ZEBRA® connector use the following formulas:

Where: Cw = Contact pad width in inches
H = ZEBRA® connector height in inches
W = ZEBRA® connector width in inches

Metric:

$$R = \frac{60 \times H}{E_W \times W}$$

Inches:

$$R = \frac{2.37 \times H}{E_W \times W}$$

Where:

R = Resistance (Ω)
E_W = Electrode Pad width (mm or inches)
W = Connector width (mm or inches)
H = Connector height (mm or inches)

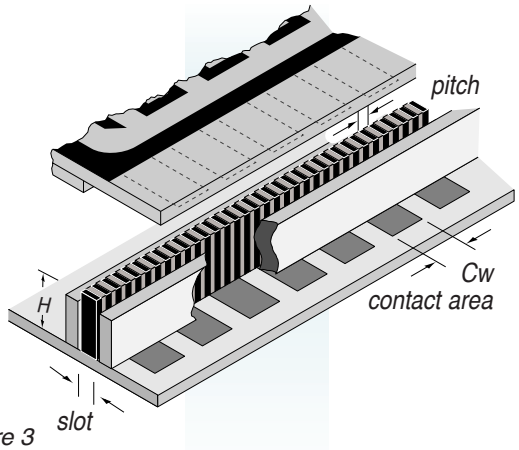


Figure 3

NOMINAL FORCE DEFLECTION - PLAIN ZEBRA® OR INSULATION BARRIER TYPE

ZEBRA® connectors should be deflected 5% to 25% of H. To calculate F-Force for deflection, use the following formula:

Where:

F = Force (N)

$$D = \frac{H - H_1 \times 100\ (\%)}{H}$$

H = Height of connector (mm or inches)
H_1 = Deflected height of connector (mm or inches)
W = Width of connector (mm or inches)
W_1 = Width of ZEBRA portion (mm or inches)
L = Length of connector (mm or inches)

Metric:

$$F(N) = 9 \times D \times W \times L \times 9.8 \times 10^{-3}$$

Inches:

$$F(N) = 5806 \times D \times W \times L \times 9.8 \times 10^{-3}$$

NOMINAL FORCE DEFLECTION - SILICONE SUPPORT TYPE

Metric:

$$F(N) = [(9 \times D \times W_1 \times L) + \{2.2 \times D \times (W-W_1) \times L\}] \times 9.8 \times 10^{-3}$$

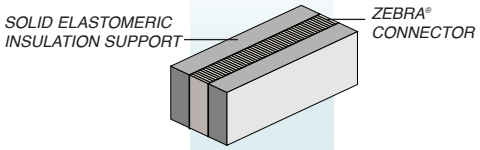
Inches:

$$F(N) = [(5806 \times D \times W_1 \times L) + \{1419 \times D \times (W-W_1) \times L\}] \times 9.8 \times 10^{-3}$$

All dimensions in inches and millimeters

ZEBRA® SOLID SELF-SUPPORTED CONNECTORS

The Solid Self-Supporting ZEBRA® connector utilizes a standard ZEBRA® connector element supported by a soft, non-conductive silicone rubber on one or two sides. The silicone rubber creates a larger width that eliminates the need for a holder, and yet the force required for deflection is very low. The standard Solid Self-Supporting ZEBRA® connector has a 0.020"/0.50mm wide ZEBRA® connector element and is available in 8 different widths to accommodate LCD's with a glass lip overhang of 0.050"/1.27 mm minimum.



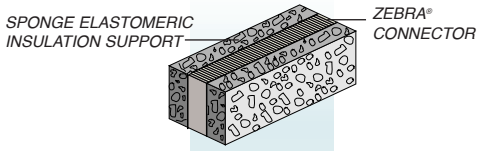
ZEBRA® Element	LCD Contact Spacing in/mm	Standard Connector Widths		
2004 (CZ418)	0.020/0.50	0.050 in./ 1.27 mm	0.090 in./ 2.3 mm	
1002 (CZ410/CZ710)	0.010/0.25	0.060 in./ 1.50 mm	0.100 in./ 2.5 mm	
2005 (CZ405/CZ705)	0.006/0.15	0.070 in./ 1.8 mm	0.120 in./ 3.00 mm	
		0.080 in./ 2.0 mm	0.140 in./ 3.50 mm	

Measurement	Tolerance (inches/mm)
Length=L	0.157 in. to 2.40 in. — ± 0.008 in. / 4.00 mm to 61.00 mm — ± 0.20 mm 2.410 in. to 6.00 in. — ± 0.015 in. / 61.2 mm to 152.4 mm — ± 0.38 mm 6.010 in. to 7.87 in. — ± 0.020 in. / 152.6 mm to 200.0 mm — ± 0.50 mm 7.880 in. to 9.00 in. — ± 0.039 in. / 200.1 mm to 230.0 mm — ± 1.00 mm
Height=H	0.039 in. to 0.750 in. ± 0.005 in. / 1.0 mm to 19mm ± 0.127 mm above 0.750 in/19.0 mm consult factory
Width=W	0.050 in. to 0.079 in. — ±0.006 in. / 1.27 mm to 2.00 mm — ± 0.15 mm 0.080 in. to 0.100 in. — ±0.007 in. / 2.03 mm to 2.54 mm — ± 0.18 mm 0.101 in. to 0.140 in. — ±0.008 in. / 2.55 mm to 3.50 mm — ± 0.20 mm above 0.140 in./3.50 mm and for custom widths consult factory.

ZEBRA® Connectors	Temperature Range Minimum	Maximum	Current Carrying Capacity 0.040" x 0.040" pad	Resistance Between Layers
All series	-40°F	212°F	0.005 amps	10^{12} ohms
	-40°C	100°C		

ZEBRA® SPONGE SELF-SUPPORTED CONNECTORS

The Self Supporting Sponge ZEBRA® connector utilizes standard ZEBRA® connector elements supported by a silicone sponge rubber on one or two sides. The silicone sponge creates a larger width that can eliminate the need for a holder, and yet the force required for deflection is very low. The standard Self Supporting Sponge ZEBRA® connector is available in a host of widths to accommodate LCD's with a glass lip overhang of 0.060"/1.5 mm minimum. The Self Supporting Sponge ZEBRA® connector is used to connect LCD's to printed circuit boards and eliminates bowing of the printed circuit board due to the low force required to make contact.



ZEBRA® Element	LCD Contact Spacing in/mm	Standard Connector Widths		
2004 (CZ418)	0.020/0.50	.060 in./ 1.5 mm	.087 in./ 2.0 mm	.118 in./ 3.0 mm
1002 (CZ410)	0.010/0.25	.063 in./ 1.6 mm	.091 in./ 2.3 mm	.126 in./ 3.2 mm
2005 (CZ405)	0.006/0.15	.067 in./ 1.7 mm	.100 in./ 2.5 mm	.138 in./ 3.5 mm
		.070 in./ 1.8 mm	.102 in./ 2.6 mm	.150 in./ 3.8 mm
		.075 in./ 1.9 mm	.106 in./ 2.7 mm	.157 in./ 4.0 mm
		.079 in./ 2.0 mm	.110 in./ 2.8 mm	

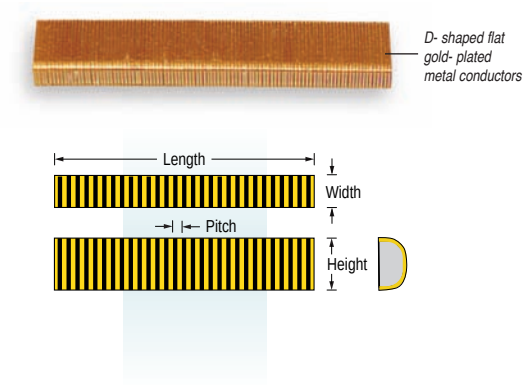
Measurement	Tolerance (inches/mm)
Length=L	0.157 in. to 2.40 in. — ± 0.008 in. / 4.00 mm to 61.00 mm — ± 0.20 mm 2.410 in. to 6.00 in. — ± 0.015 in. / 61.2 mm to 152.4 mm — ± 0.38 mm 6.010 in. to 7.87 in. — ± 0.020 in. / 152.6 mm to 200.0 mm — ± 0.50 mm
Height=H	0.039 in. to 0.750 in. ± 0.005 in. / 1.0 mm to 19mm ± 0.127 mm above 0.750 in/19.0 mm consult factory
Width=W	0.060 in. to 0.157 in. — ±0.004 in. / 1.52 mm to 4.0 mm — ± 0.1 mm above 0.157 in./4.00 mm consult factory.

ZEBRA® Connectors	Temperature Range Minimum	Maximum	Current Carrying Capacity 0.040" x 0.040" pad	Resistance Between Layers
All series	-55°F	260°F	0.005 amps	10^{12} ohms
	-50°C	125°C		

All dimensions in inches and millimeters

ZEBRA® GOLD 8000 CONNECTORS

The FUJIPOLY ZEBRA® Series 8000 elastomeric connector elements are D-shaped, low durometer silicone elastomer cores around which flat metallic gold-plated conductors are vulcanized in a row parallel to each other. The tips of the metallic conductors are turned upward so that point contact can be effected; in addition, contact is made to the flat area when the connector element is positioned between two printed circuit boards. The point contact will penetrate surface oxides or contaminants which might be present on the surface of the contact pads, thus assuring reliable electrical connection on two planes. Also available are standard board-to-board assemblies which include connector and holder.



DIMENSIONAL SPECIFICATIONS

Connector Dimensions*	Minimum		Maximum	
Length=L	0.200" ± 0.005"	5.08mm ± 0.127mm	6.000" ± 0.030"	152.4mm ± 0.762mm
Height=H	0.100" ± 0.005"	2.54mm ± 0.127mm	0.500" ± 0.015"	12.70mm ± 0.381mm
Width=W	0.060" ± 0.005"	1.52mm ± 0.127mm	0.125" ± 0.010"	3.18mm ± 0.254mm

Note: *For good design practice and low deflection force requirements, the height "H" should be twice the width "W". For other sizes consult factory.*

MATERIALS

Connector Component	Materials Used
Conductive Elements	Gold-plated copper wire. gold 0.00025mm (0.00001"), nickel 0.0013mm (0.00005").
Wire Size and Spacing (Series 8000 A,B and C)	**A.** 0.05mm x 0.127mm (0.002" x 0.005") flat wire on 0.25mm (0.010") center-to-center spacing. (Min. 100 wires/ inch.) **B.** 0.05mm x 0.10mm (0.002" x 0.004") flat wire on 0.19mm (0.0075") center-to-center spacing. (Min. 133 wires/inch.) **C.** 0.025mm x 0.076mm (0.001" x 0.003") flat wire on 0.15mm (0.006") center-to-center spacing. (Min. 166 wires/inch.)
Connector body	Non-conductive tan color silicone rubber. UL-94-HB rating, 500 volts/mil dielectric strength.
Film	0.025mm (0.001") thick polyamide dielectric strength of film ASTM-D-149, 2000 volts/mil.

PERFORMANCE CHARACTERISTICS

Parameter	Conditions and Performance
Contact Resistance	Less than 25 milliohms on 0.025" wide contact pads; 0.100 amperes DC, Kelvin- type four probe test method
Insulation Resistance	Minimum 10^{12} ohms between adjacent conductive elements.
Current Carrying Capacity	Series 8000 A and B, 500 mA per wire max.; Series 8000 C, 250 mA per wire max.
Capacitance	Maximum 0.100 picofarads per adjacent pad at 1 MHz and 0.100" high ("H").
Inductance	Maximum 7 nanohenries per adjacent pad at 1 MHz and 0.100" high ("H").
Repeated Actuations	500 actuations without appreciable change in contact resistance (deflection of 15%).
Deflection	8% to 20%. Recommended deflection 10 to 15% of original height.
Deflection Force/Inch	4lbs. per linear inch for 15% deflection for a 0.062" ("W") x 0.285 ("H") connector.
Operating Temperature Range	-20° C min., 125° C max.
Salt Spray Test	MIL-STD-202E, method 101D, condition B. 5% salt solution 95° F, 48 hours. There was no evidence of blistering or peeling of the contact material.
Temperature Cycling	MIL-STD-202E, method 102A, condition D, -55° C, 25° C, 125° C. There was no change in the physical properties of the specimens.
Humidity (Steady State)	MIL-STD-202E, method 103B, condition C modified. 95% RH room temperature. There was no appreciable change in contact resistance after 500 hours exposure.
Corrosive Environment	1,000 hours exposure at 1 ppm H_2S and 1 ppm O_2, 60° C AND 75% RH. Slight change in contact resistance; no evidence of contact peeling or blistering.

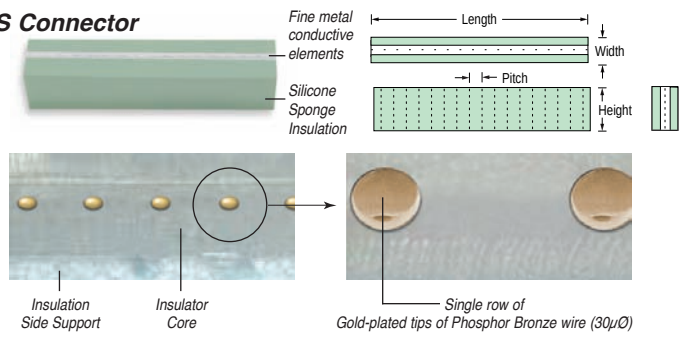
All dimensions in inches and millimeters

ZEBRA® FG-S CONNECTORS

The FG-S Connectors have anisotropic conduction properties. Thin metal wires are embedded with a vertical orientation within the silicone rubber on 0.10 mm centers. Low resistance and high current carrying capacity make this series very versatile for most typical interconnect applications.

The basic FG-S design is one row of gold-plated tips of Phosphor Bronze wires embedded in silicone rubber which will connect two parallel sets of contact, both having one row of contact pads.

FG-S Connector



Property	Unit	Measure FG-S		Method
Insulation Material	–	silicone rubber	silicone sponge	–
Color	–	clear or white	blue	Visual
Specific Gravity	g/cm^3	1.02	0.74	ASTM D792
Hardness	Durometer A	47	–	ASTM D2240
Tensile Strength	MPa	3	–	ASTM D412
Elongation	%	240	–	ASTM D412
Volume Resistivity	MΩ-m	7.0×10^6	–	ASTM D257
Conductive Material	Type	tips of Phosphor Bronze wire; Gold-Plated		–
Wire Diameter	μm	30		–
Gold-Plated Thickness	μm	0.15		–
Dimensions, Tolerances				
Width (W)	mm .../... in	1.40 to 3.00 ± 0.20 .../... 0.055" to 0.120" ± 0.008"		–
Length (L)	mm .../... in	10.00 to 25.00 ± 0.25 .../... 0.393" to 0.984" ± 0.010" 25.01 to 50.00 ± 0.30 .../... 0.985" to 1.96" ± 0.012" 50.01 to 80.00 ± 0.40 .../... 1.97" to 3.14" ± 0.016" 80.01 to 120.00 ± 0.50 .../... 3.15" to 4.72" ± 0.020"		–
Height (H) **(note: H ≧ W)**	mm .../... in	1.40 to 4.00 ± 0.10 .../... 0.055" to 0.157" ± 0.004" 4.01 to 10.00 ± 0.15 .../... 0.158" to 0.393" ± 0.006"		–
Core: Width (W)	mm .../... in	0.40 ± 0.08 ...../..... 0.016" ± 0.003"		–
Pitch (P)	mm .../... in	0.10 ± 0.05 ...../..... 0.004" ± 0.002"		
Skewness	degrees	2° Maximum		
Recommended Dimensions: Connector Height versus Electrode Width and Gap	mm .../... in	Connector Height	Electrode Width	Electrode Gap
		min. 1.4 .../... 0.055"	0.21 .../... 0.008" or more	0.21 .../... 0.008" or more
		2.0 .../... 0.079"	0.22 .../... 0.009" or more	0.22 .../... 0.009" or more
		3.0 .../... 0.118"	0.24 .../... 0.009" or more	0.24 .../... 0.009" or more
		4.0 .../... 0.157"	0.25 .../... 0.010" or more	0.25 .../... 0.010" or more
		5.0 .../... 0.197"	0.27 .../... 0.011" or more	0.27 .../... 0.011" or more
		6.0 .../... 0.236"	0.29 .../... 0.011" or more	0.29 .../... 0.011" or more
		7.0 .../... 0.276"	0.31 .../... 0.012" or more	0.31 .../... 0.012" or more
		8.0 .../... 0.315"	0.32 .../... 0.013" or more	0.32 .../... 0.013" or more
		9.0 .../... 0.354"	0.34 .../... 0.014" or more	0.34 .../... 0.014" or more
		max. 10.0 .../... 0.393"	0.36 .../... 0.014" or more	0.36 .../... 0.014" or more

All dimensions in inches and millimeters

CROSS-SECTIONAL VIEW

Figure 2 shows the dimensions of the ZEBRA® FG-S Connectors. When ordering, the dimensions should be specified within the limits shown in Table B.

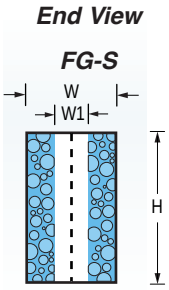


Figure 2

Note: *Vertical contact wires may appear at each end of the length dimension, but do not affect performance. Maximum skewness < 2°*

TYPICAL INSTALLATION

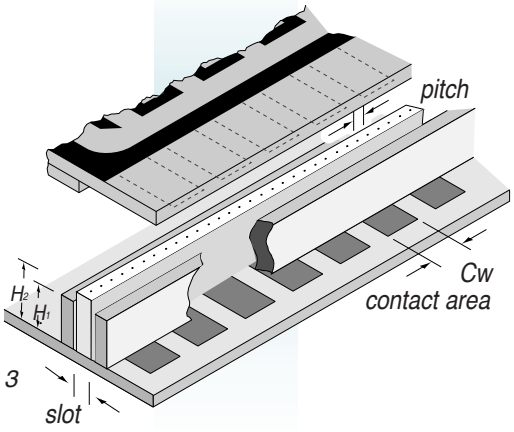
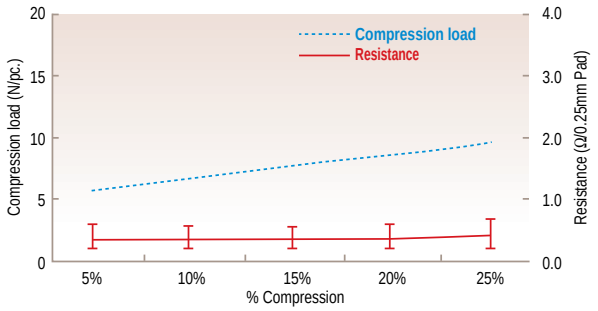


Figure 3

TYPICAL PERFORMANCE CHARACTERISTICS

FG-S CONNECTOR: COMPRESSION % vs. LOAD AND RESISTANCE

Specimen: Connector FG-S (2mmW x 10mmL x 3mmH)



Compression % vs. Force (N/pc.)

%	5%	10%	15%	20%	25%
Aver. N/pc.	5.7	6.6	7.5	8.4	9.6

Resistance vs. Compression % (Ω/0.25mm Pad)

%	5%	10%	15%	20%	25%
Aver. Ω	0.36	0.35	0.35	0.36	0.38
Max. Ω	0.61	0.59	0.59	0.62	0.70
Min. Ω	0.23	0.22	0.22	0.22	0.22

COMPARISON DATA

Measurement	FG-S	Test Condition
Continuity Resistance	0.50Ω/pad (0.25mm Width Pad)	see right
Current Carrying Capacity	30 mA/wire	
Insulation Resistance	> 20 MΩ (Gap=0.25mm)	
Temperature Range	-40° C to +85° C -40° F to +185° F	
Compression Range	5% to 20% H < 3mm, 0.15 ~ 0.60mm H ≧ 3mm consult factory for application specifics	

TEST METHOD FOR COMPRESSION % vs. LOAD AND RESISTANCE

Test Method for FG-S Connectors in the charts on this page used the following physical and electrical parameters:

- *Electrodes: (Upper) Gold-plated PCB (common type electrode) (Lower) 0.5mm P, 0.25mm Pad's W, Gold-plated PCB*
- *Space of electrodes @ 0.25, 50VDC*
- *Measurement: Digital ohm meter & Compression load meter*
- *Using Amps: 100mA D.C.*
- *Condition: Measured at room temperature 30 minutes later*

All dimensions in inches and millimeters

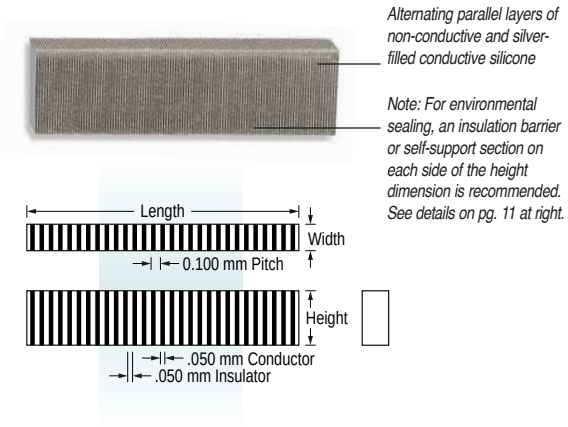
Elastomeric Connectors

ZEBRA® HIGH PERFORMANCE SILVER CONNECTORS

FUJIPOLY low resistance ZEBRA® elastomeric connectors are constructed of alternating parallel layers of electrically conductive and non-conductive silicone elastomer. The electrically conductive layer is filled with silver-metal particles.

The composite alternating layers provide reliable electrical connection when placed between two aligned conducting surfaces.

The low resistance ZEBRA® provides a redundant connection with a minimum of two conductive layers recommended per PC contact pad. The connector is available with insulating barrier or silicone supports (See page 6). The connectors are used for connecting electroluminescent (EL) and plasma type displays to PC boards or for connecting hybrid circuits to PC boards, among other applications.



Low resistance ZEBRA® connectors are positioned between two aligned surfaces and are mechanically clamped together with a lid or another PC board. The connectors may be free standing or positioned in a retainer depending on packaging profiles and design.

Series	Contact Spacing Center-to-Center Minimum	Pitch: Sum of the Thickness of an Adjacent Conductive and Non-conductive Layer Nominal	Pitch: Sum of the Thickness of an Adjacent Conductive and Non-conductive Layer Maximum	Conductive Layers per inch Minimum	Individual Conductive and Insulating Layer Thickness Minimum	Individual Conductive and Insulating Layer Thickness Maximum	Available Lengths
5002 (SZ100)	0.015 in. 0.38 mm	0.004 in. 0.100 mm	0.006 in. 0.152 mm	240	0.001 in. 0.025 mm	0.003 in. 0.075 mm	5.00 in. 127 mm

TABLE A (For requirements over 4" consult factory)

Measurement	Tolerance (inches/mm)
Length=L	0.250 ± 0.005 in. to 5.000 ± 0.025 in. ····/···· 6.35 ± 0.12mm to 127.00 ± 0.64mm
Height=H	0.040 ± 0.003 in. to 0.500 ± 0.007 in. ····/···· 1.00 ± 0.08mm to 12.70 ± 0.18mm
Width=W	0.020 ± 0.003 in. to 0.100 ± 0.005 in. ····/···· 0.50 ± 0.08mm to 2.54 ± 0.13mm

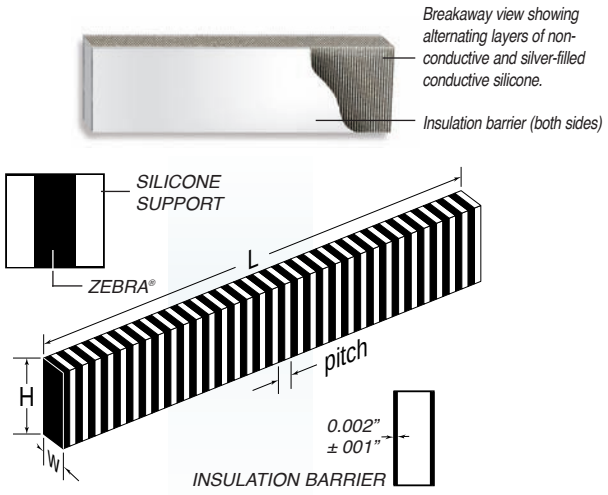
TABLE B

ZEBRA® Connectors	Temperature Range Minimum	Temperature Range Maximum	Current Carrying Capacity 0.040" x 0.040" pad	Resistance Between Layers
Silver ZEBRA®	-40°F -40°C	185°F 85°C	0.3 amps	10^{12} ohms

TABLE C

All dimensions in inches and millimeters

SELF-SUPPORT AND INSULATION BARRIER



Details show silicone support (left) and insulation barrier (right). Each is available on one or both sides. Configurations may also include support on one side and insulation on the other.

***Note:** Recommended Height (H) should be twice Width (W) dimension for minimum force deflection. Maximum Skewness 2% of Height.*

DESIGN RECOMMENDATIONS

Recommended deflection range is 5-25% of free height. Minimum deflection will vary with packaging applications and should consider overall height, PC board warpage, finish, etc. (Contact Fujipoly Product Application Engineering for assistance.) Design recommendations for solid ZEBRA® over 0.400" deflect 0.050" maximum. Silicone supported over 0.400" deflect 0.060" typical.

TEST CONDITIONS:

The use of an insulating barrier or silicone self-support material on one or both sides of the connector is recommended. The silicone support is utilized to reduce clamp force and provide an element of environmental protection for a cost-effective connection.

Item	Standard	Test Method
High Temperature	MIL-202D-108A	85° C 1500 hr
Low Temperature	—	-40° C 500 hr
Moisture	MIL-202D-103B	40° C 95% RH x 500 hr (250mA/pad)
Thermal cycle	MIL-202E-107G	65°C/25°C/150°C/ 25°C, 5 cycles

NOMINAL RESISTANCE CALCULATION

For the purpose of calculating the resistance of silver ZEBRA® connectors and testing them for compliance please use the following formula:

Where: R = Resistance in Ohms
W_1. = Width of ZEBRA® portion (inches or mm)
E_W = Electrode pad width (inches or mm)
H = ZEBRA® height (inches or mm)

Metric (mm)

$$R = \frac{H \times 0.01}{E_W \times W_1} + 0.10$$

English (inches)

$$R = \frac{H \times 0.0004}{E_W \times W_1} + 0.10$$

Example: if ZEBRA® is 0.100"/2.54 mm H and 0.030"/0.762mm W, then the maximum resistance on a 0.050"/1.27 mm wide pad will be:

Metric

$$R = \frac{2.54 \times 0.01}{0.762 \times 1.27} + 0.10 = 0.127 \text{ ohms}$$

English:

$$R = \frac{0.100 \times 0.0004}{0.030 \times 0.050} + 0.10 = 0.127 \text{ ohms}$$

NOMINAL FORCE DEFLECTION - PLAIN ZEBRA® OR INSULATION BARRIER TYPE

ZEBRA® connectors should be deflected 5% to 25% of H. To calculate F-Force for deflection, use the following formula:

Where:

F = Force (N)

$$D = \frac{H - H_1}{H} \times 100\ (\%)$$

H = Height of connector (mm or inches)
H_1 = Deflected height of connector (mm or inches)
W = Width of connector (mm or inches)
W_1 = Width of ZEBRA portion (mm or inches)
L = Length of connector (mm or inches)

Metric:

$$F(N) = 10.0 \times D \times W \times L \times 9.8 \times 10^{3}$$

Inches:

$$F(N) = 6452 \times D \times W \times L \times 9.8 \times 10^{3}$$

NOMINAL FORCE DEFLECTION - SILICONE SUPPORT TYPE

Metric:

$$F(N) = [(10.0 \times D \times W_1 \times L) + \{2.2 \times D \times (W-W_1) \times L\}] \times 9.8 \times 10^{3}$$

Inches:

$$F(N) = [(6452 \times D \times W_1 \times L) + \{1149 \times D \times (W-W_1) \times L\}] \times 9.8 \times 10^{3}$$