

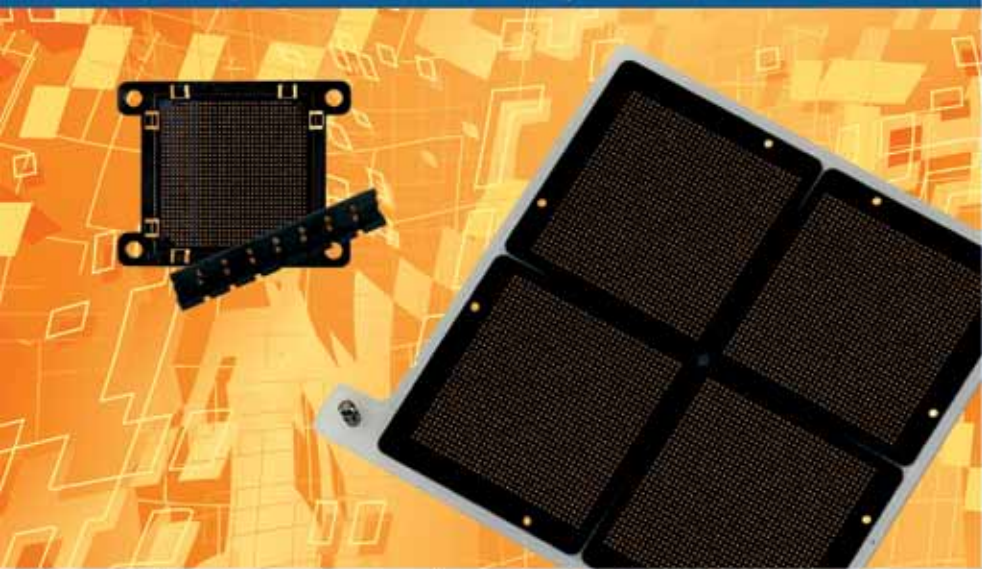
# Design Guide

## CIN::APSE®

Compression Interconnects

Enabling Technology for The Most  
Demanding Interconnect Applications

Land Grid Arrays, Board to Board, and Component to Board Interconnects



# Welcome

This guide has been designed to familiarize you with CIN::APSE® - the unique, high-performance, solderless interconnect solution - and to guide you in using CIN::APSE® in your applications.

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## CIN::APSE® Technology

CIN::APSE® is a solderless Z-axis interconnect technology that offers exceptional mechanical and electrical performance. Custom made to your specifications, CIN::APSE® utilizes a multi-point contact that can handle signals well above 20 GHz, while offering a superior combination of small size, low inductance, and exceptional resistance to shock, vibration and thermal cycling.



**Connector Cross Section Showing  
CIN::APSE® Contact**

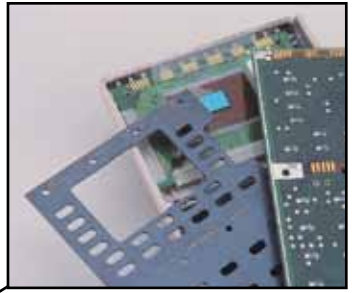
The key to this highly innovative technology is the CIN::APSE® contact (shown left). The contacts, which are made from randomly wound gold plated molybdenum wire, are loaded into a plastic insulator engineered to the exact requirements of the application. Cinch's patented hourglass hole design retains the contact and allows the contact to float in the insulator, while maintaining contact even under extreme thermal expansion mismatches between mated substrates.

# CIN::APSE<sup>®</sup> Applications

CIN::APSE<sup>®</sup> can be used in almost any application where you need to connect two parallel surfaces.

Common applications include:

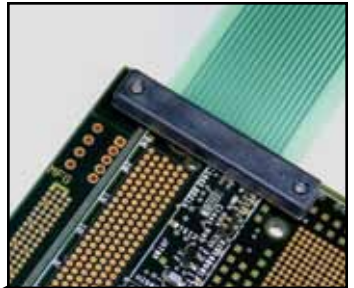
- Board to Board
- Chip Package to Board/Land Grid Array (LGA)
- Flex to Board
- Component to Board



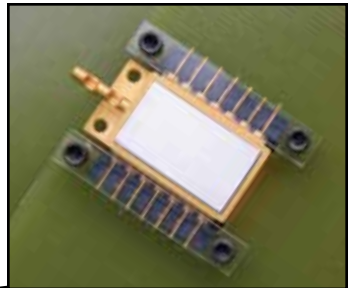
**Board to Board**



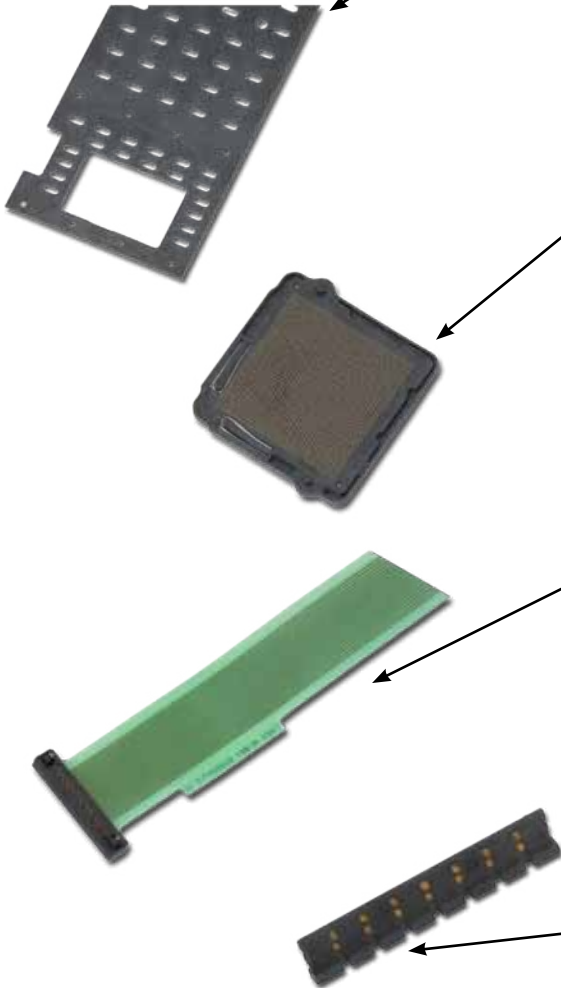
**Chip Package to Board**



**Flex to Board**



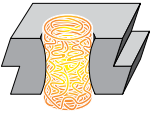
**Component to Board**



# CIN::APSE® Configurations

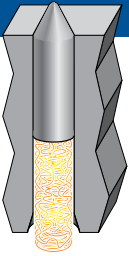
By using different sizes of contacts, plungers, and spacers, a wide range of contact configurations can be created. To choose the one that best fits your application, consider the examples given below in conjunction with your mating requirements and Z-axis height.

## 1 Contact Only



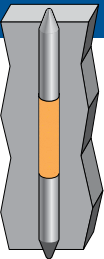
This CIN::APSE® configuration provides multiple points of contact and mechanical wipe. It is ideally suited for applications requiring high speed, low profile, and high density. LGA sockets and flex to board interconnects commonly use this configuration.

## 2 Plunger-Contact



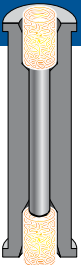
The addition of a plunger increases the handling durability of the CIN::APSE® contacts and provides additional height. This configuration is well-matched for board to board and test applications.

## 3 Plunger-Contact-Plunger



Adding a second plunger to the connector results in a tall system - up to 1.0" [25.4mm] - that is also the most durable in terms of handling. This configuration is best suited for contacts that have excessive handling from both sides. It is generally used for parallel board to board stacking connector applications.

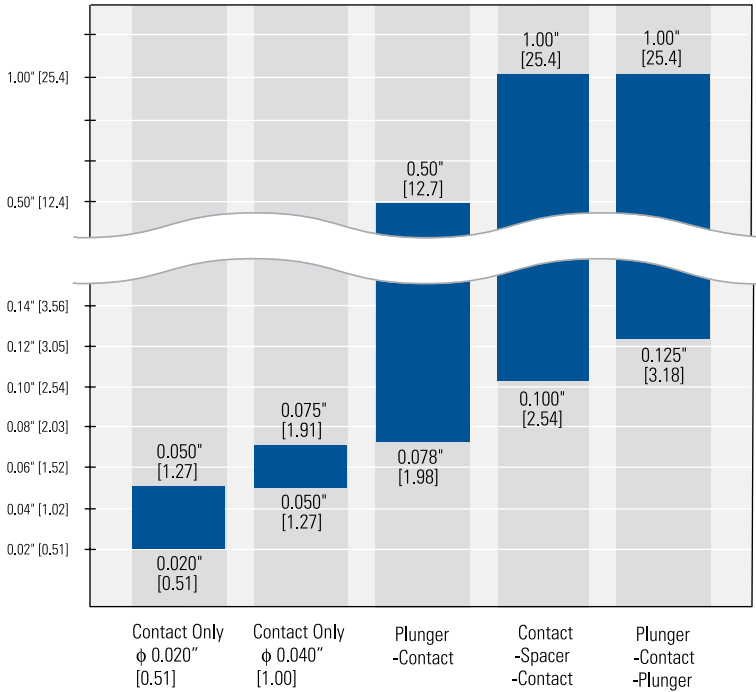
## 4 Contact-Spacer-Contact



Using two contacts with a spacer in between creates a connector with all the benefits of the contact only style, and the ability to span greater Z-axis heights - up to 1.0" [25.4mm]. This configuration is most often used in high shock and vibration environments, when multiple points of contact are needed in a tall connector.

Mated Height Range in inches [mm]

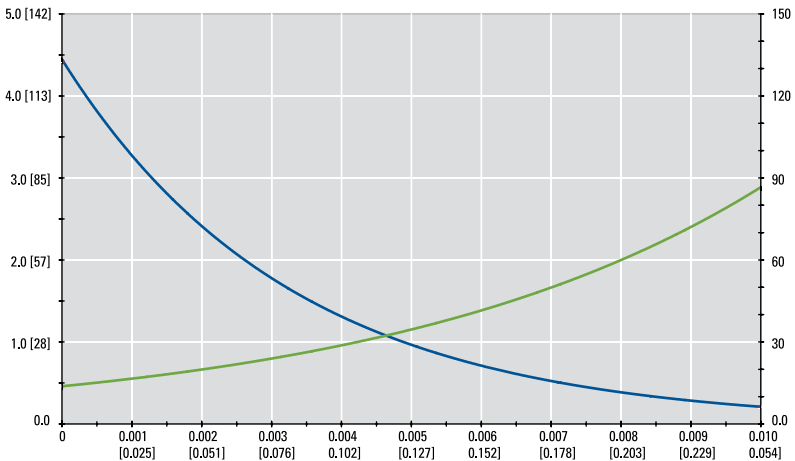
### Mated Height Range for Different Configurations



### CIN::APSE Configurations in inches [mm]

Force per Contact in ounces [g]

### Typical Curve for a 0.020" Dia. Contact in an Insulator 0.032" [0.81] thick



Resistance [mΩ]

Deflection in inches [mm] - Total Distance Above Insulator

Force Resistance

# Design Guidelines

Here are some basic guidelines to follow when laying out your PCB, flex circuit or chip package to work with the CIN::APSE® contacts.

1. Ensure that mated height stays within specified range. (pg. 5)
2. Gold interfaces are needed on contact surfaces being mated. (below)
3. Compression must be applied and maintained within the specified range. (pg. 5)  
A compression system may be required. (pg. 7)
4. The operating environment (temperature) must be compatible with the contact and insulator material. (pg. 8)

General Configuration Guidelines	
Pad Plating	15-30 µin Au over 50 µin Ni (Depending on the application, less gold has been successfully used)
In-Pad Vias	Open vias allowable; Maximum diameter of 0.010" [0.25mm] (for contact only configurations)
PCB/Chip Flatness	0.003" [0.08mm] per side / 0.006" [0.16 mm] total
Pad true position	Typically 0.008" [0.20 mm]

Specific Configuration Guidelines (in inches [mm] and ounces [g])					
Characteristics	Contact Only ϕ 0.020" [0.508]	Contact - Plunger	Plunger - Contact - Plunger	Contact - Spacer - Contact	Contact Only ϕ 0.040" [1.02]
Pad Size (+/- 0.003")	0.027" [0.69]	0.027" [0.69]	0.020" [0.51]	0.027" [0.69]	0.054" [1.37]
Min. Center-Spacing	0.040" [1.00]	0.050" [1.27]	0.050" [1.27]	0.050" [1.27]	0.070" [1.78]
Min. Compression* Force/contact	2.5 oz [71]	2.5 oz [71]	2.5 oz [71]	2.5 oz [71]	4 oz [113]
Working Compression Range	0-0.006" [0.15]	0-0.006" [0.15]	0-0.010" [0.25]	0-0.012" [0.30]	0-0.008" [0.20]

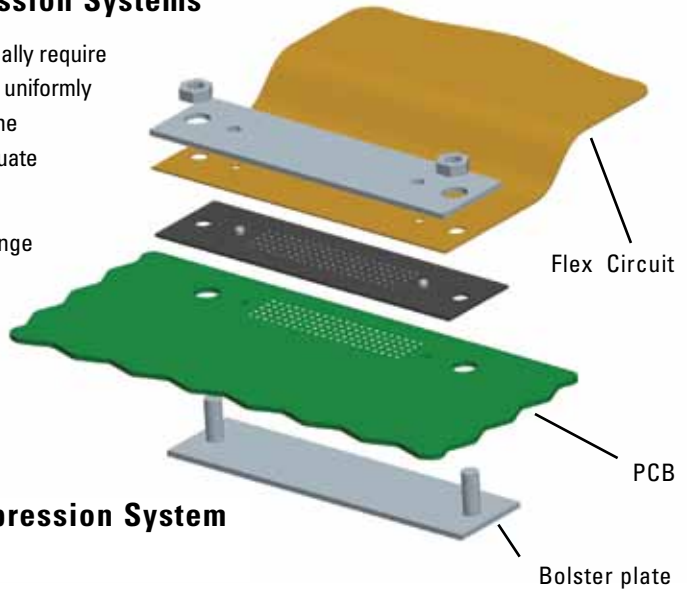
\* For reference only. Compression force depends on number of contacts and insulator geometry used in an application. Contact Cinch before starting your design to verify the optimal compression force for your design.

CIN::APSE® Materials	
Contact	Gold plated molybdenum
Spacer	Gold plated brass or copper alloy
Plunger	Gold plated brass or copper alloy
Insulator Housing - Molded	Liquid Crystal Polymer or Ultem
Insulator Housing - Machined	Ultem or Torlon
Packaging Trays	Antistat ABS

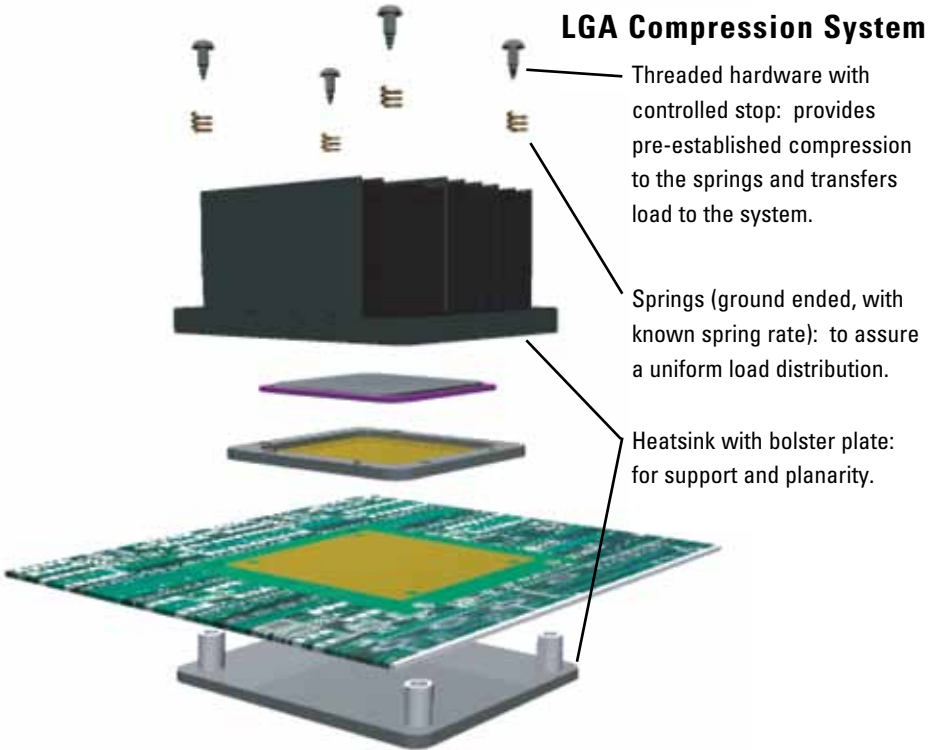
# CIN::APSE® Compression Systems

CIN::APSE® applications typically require a compression system, which uniformly distributes force throughout the connector, and ensures adequate planarity.

Compression systems can range from simple fasteners or screws to more sophisticated systems as the I/O count increases.



## Flex Circuit Compression System



Cinch has years of experience in designing compression systems for CIN::APSE® applications. Please contact us to help optimize a compression system to meet your specific application.



# Typical Performance Characteristics

## Electrical\* (at full compression)

Characteristics	ϕ 0.020" [0.50]				ϕ 0.040" [1.00]
	Contact Only	Contact - Plunger	Plunger - Contact - Plunger	Contact - Spacer - Contact	Contact Only
Contact Resistance	<15 mΩ	<35 mΩ	<50 mΩ	<45mΩ	<5 mΩ
Inductance	<0.5 nH	<0.5 nH	<2 nH	<1 nH	<1 nH
Current Carrying Capacity	3-6 A	1-3 A	1-3 A	1-3 A	5-10 A
High Frequency Capability	> 20 GHz				
Insulation Resistance	>1,000 MΩ's @ 500 VDC				
Dielectric Withstanding Voltage	500 VDC (sea level) No breakdown				

Characteristic	Test Condition	Result
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## Mechanical\*

Durability	Room temperature	>25,000 cycles
Vibration	20 Gs; 10-2,000 Hz; no discontinuity greater than 2 nanoseconds	No discontinuity
Shock	100 Gs; 6 milliseconds; no discontinuity greater than 2 nanoseconds	No discontinuity

## Environmental\*

Temperature Life	5,000 hours @ 170°C	5% resistance change
Thermal Shock	100 cycles -55°C to +85°C; 2,000 cycles -20°C to +110°C	<5 mΩ change
Accelerated Thermal Cycling	3000 cycles 0°C to 100°C 40 minutes per cycle	<10 mΩ change
Mixed Flow Gas	Per EIA-364-25, 20 days, class 11A	<10 mΩ change
Temp/Humidity Cycling	500 hours 25°C to 85°C at 85%RH	<10 mΩ change

\* Test results are pass/fail criteria, not limitations of the technology. Results are for typical applications. Contact Cinch to discuss specific applications.

# Performance Characteristics - Extreme Environment

Successfully tested in customer-specific applications.

High Temperature	>1,000 hours @ 200°C
Thermal Shock	-55°C to 125°C
Low Temperature	Liquid Nitrogen (-200°C)
Shock	22,000 Gs

## For More Information

For technical and ordering information relating to CIN::APSE®, contact Cinch or your local sale representative.

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