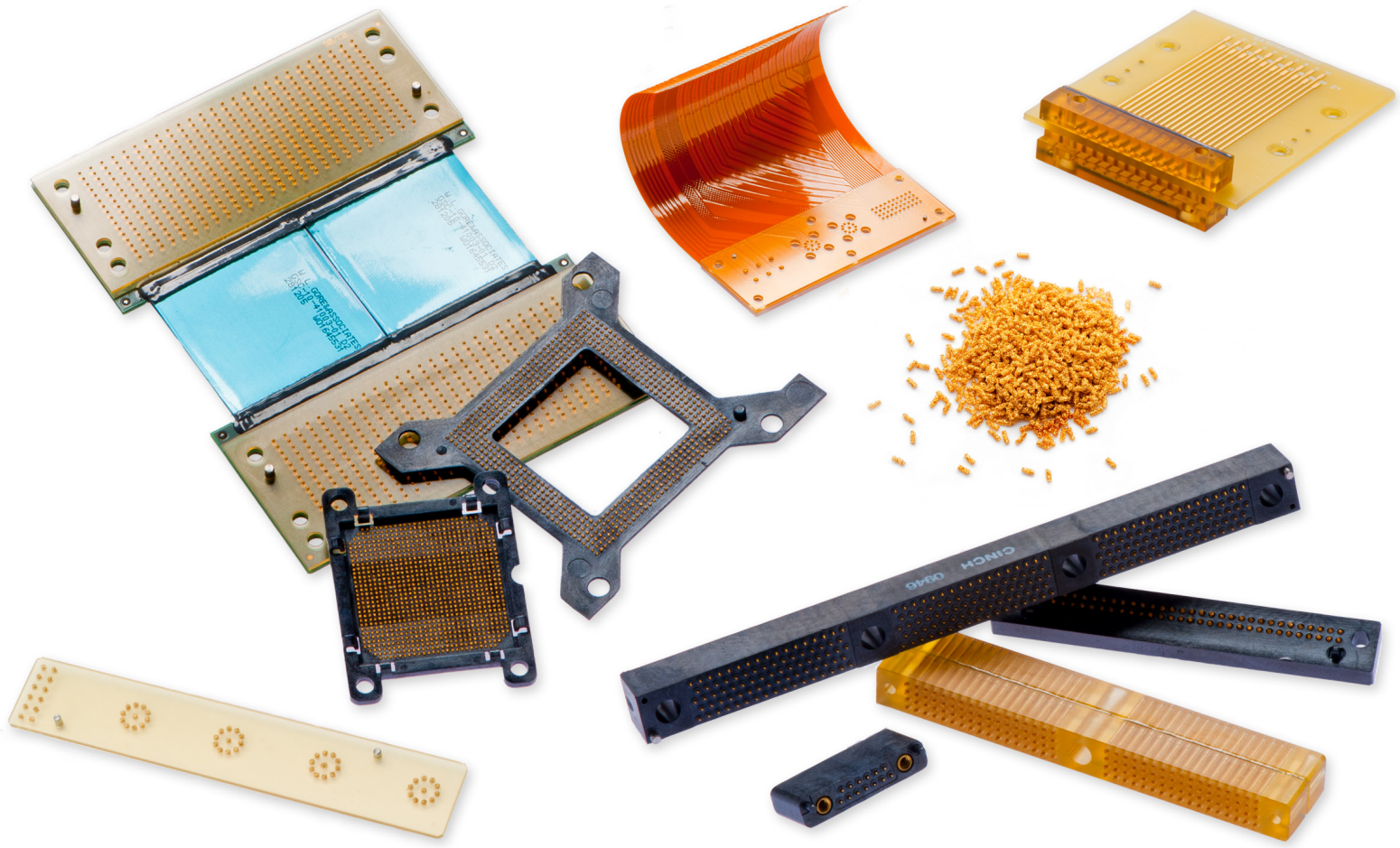
CIN::APSE®
Design Guide

Leading compression connector and electronic packaging solution



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CONNECTIVITY SOLUTIONS
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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.

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 50 GHz, while offering a superior combination of small size, low inductance, and exceptional resistance to shock, vibration and thermal cycling. CIN::APSE has the ability to combine power, signal, high speed data and RF transmissions all in one dense package.

The key to this highly innovative technology is the CIN::APSE contact (see below). The contacts, which are made from randomly wound gold plated molybdenum wire, are loaded into a machined insulator for low volume or molded 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. The insulator fixes the position of each CIN::APSE contact and also prevents overcompression.

Figure 1: Connector Cross Section Showing CIN::APSE Contact

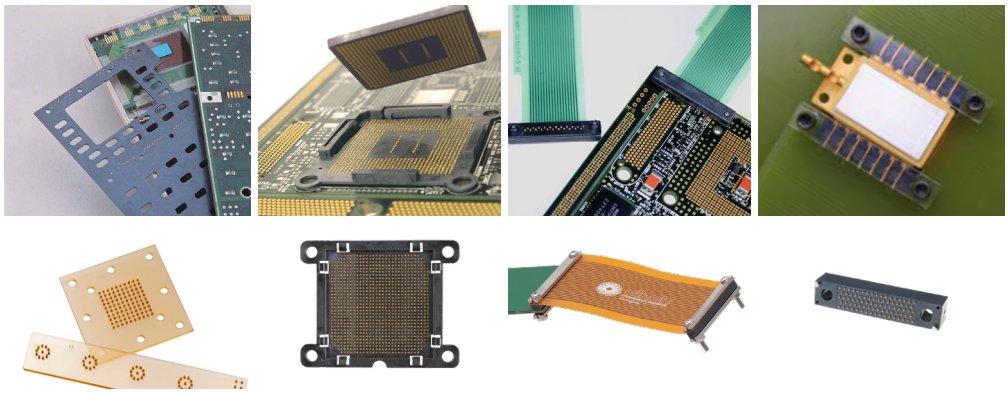
CIN::APSE APPLICATIONS

CIN::APSE 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

Figure 2: CIN::APSE Applications



Board to Board | Chip Package to Board | Flex to Board | Component to Board

CIN::APSE CONFIGURATIONS

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.

PLUNGER-CONTACT-PLUNGER

Adding a second plunger to the connector results in a tall system - up to 1.0" [25.4 mm] - 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.

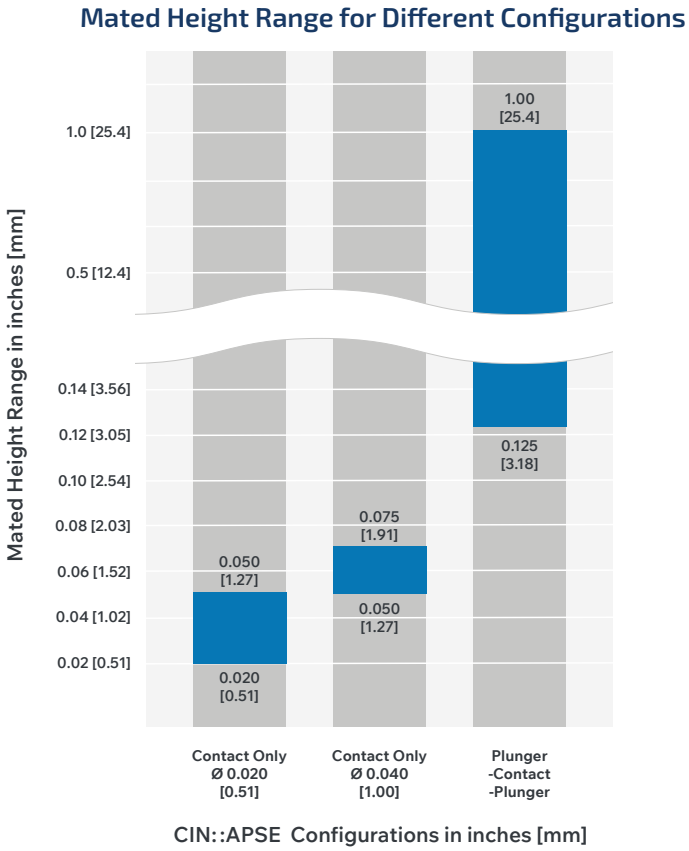
Figure 3: CIN::APSE Configurations

Contact Only

Plunger-Contact-Plunger

FORCE DEFLECTION RESISTANCE CURVE

Figure 4: Height Configurations



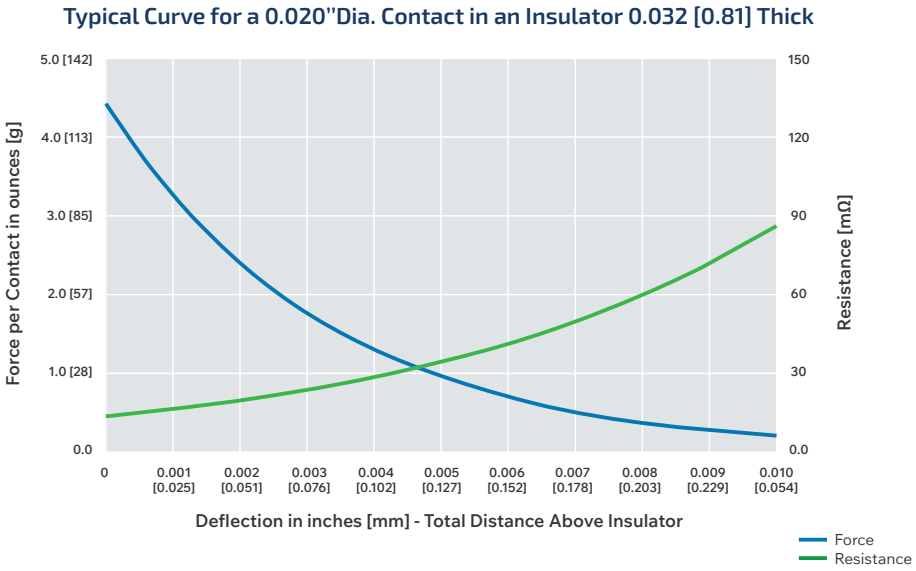


Figure 5: Force Deflection Resistance Curve

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

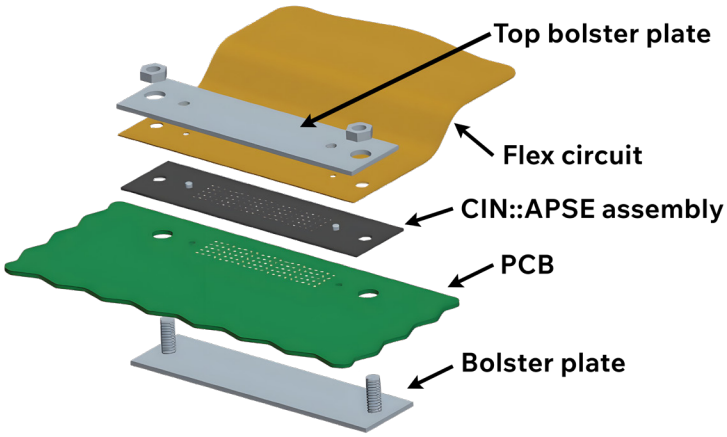


Figure 6: Flex Circuit Compression System

LGA COMPRESSION SYSTEM

Threaded hardware with controlled stop provides pre-established compression to the springs and transfers load to the system.
Springs (ground ended, with known spring rate) to assure a uniform load distribution.
Heatsink with bolster plate for support and planarity.

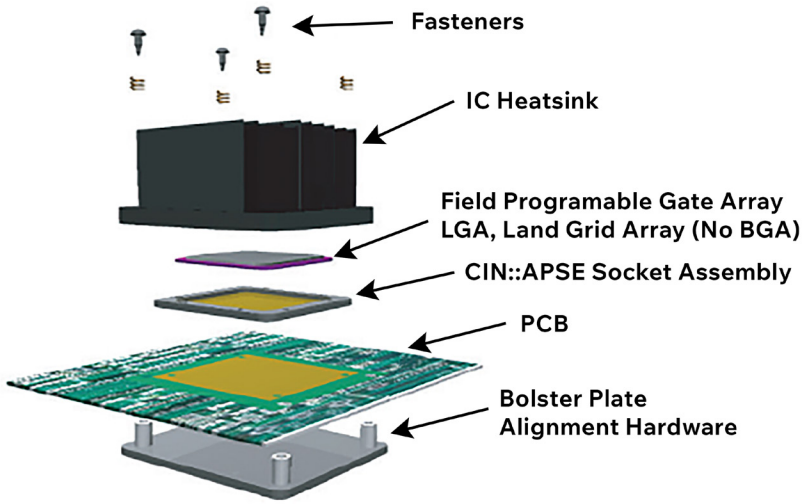


Figure 7: LGA Compression System

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.

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. List the number and type of transmissions required.
2. Review the mating surfaces to make sure they have a flatness within 0.003".
3. Ensure that mated height stays within specified range (Figure 4).
4. Gold interfaces are needed on contact surfaces being mated.
5. Compression must be applied and maintained within the specified range (Figure 5). A compression system may be required.
6. The operating environment (temperature) must be compatible with the contact and insulator material.

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" [0.25 mm] (for contact only configurations)
PCB/Chip Flatness	0.003" [0.08 mm] 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 f 0.020" [0.508]	Contact Only f 0.040" [1.02]	Plunger - Contact - Plunger
Pad Size (+/- 0.003")	0.027" [0.69]	0.054" [1.37]	0.020" [0.51]
Min. Center-Spacing	0.040" [1.00]	0.070" [1.78]	0.050" [1.27]
Min. Compression* Force/contact	2.5 oz [71]	4 oz [113]	2.5 oz [71]
Working Compression Range	0-0.006" [0.15]	0-0.008" [0.20]	0-0.010" [0.25]

** 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

ELECTRICAL* (AT FULL COMPRESSION)

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

MECHANICAL*

Durability	Room temperature	>25,000 cycles
Vibration	20 Gs; 10-2,000 Hz; no discontinuity >2 nsec	No discontinuity
Shock	100 Gs; 6 msec; no discontinuity >2 nsec	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

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