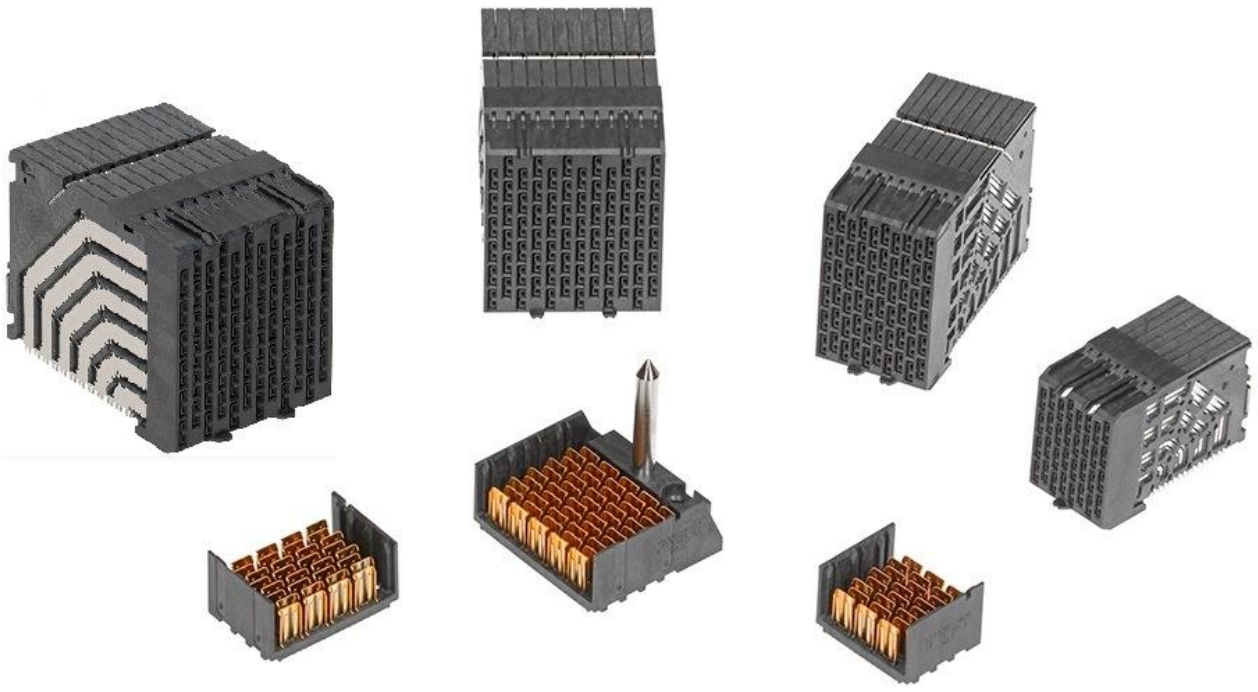
DESIGN GUIDE FOR

Impel™

INTERCONNECT SYSTEMS



REVISION DESCRIPTION	UPDATE APPLICATION TOOLING GUIDE TO APPLICATION GUIDELINE FOR INSTALLATION			DESIGN GUIDE FOR IMPEL INTERCONNECT SYSTEMS			
CHANGE NO.	648663						
REVISED BY	YLLIM	DATE	2020/10/29	DOC TYPE	DOC TYPE DESCRIPTION	DOC PART	SERIES
REV APPR BY	SHLENI	DATE	2020/11/10	PS	APPLICATION SPECIFICATION WORD	001	171320
INITIAL RELEASE				CUSTOMER	DOCUMENT NUMBER	REVISION	SHEET
INITIAL DRWN	JLAURX	DATE	2015/03/06	GENERAL MARKET	AS-171320-992	A3	1 OF 18
INITIAL APPR	JALEXANDER	DATE	2015/03/06				

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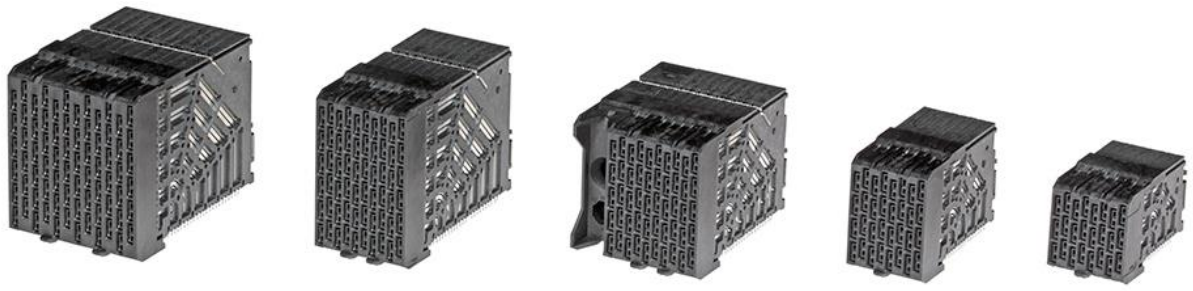
I. Introduction

A) IMPEL™ OVERVIEW

The Impel™ backplane connector system is designed for systems that target data rates up to 40 Gbps (NRZ) and superior signal density up to 80 differential pairs per inch. The Impel™ system's broad-edge-coupled technology enables low cross-talk and high signal bandwidth while minimizing channel performance variation across every differential pair within the system. Impel™ is tuned for 92Ω impedance that offers flexibility to support 100Ω and 85Ω system architectures.

The Impel™ backplane connector system is designed for traditional backplane, midplane, or midplane-less (ortho direct) architectures to meet the growing demands of next-generation telecommunication and data networking equipment manufacturers.

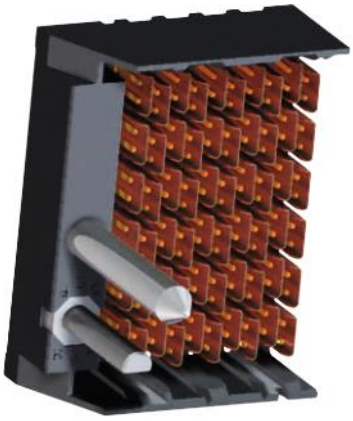
The Impel™ backplane connector system is offered in 2-pair, 3-pair, 4-pair, 5-pair, and 6-pair DC connector modules that are matched to traditional headers, coplanar, and orthogonal or orthogonal direct modules with a complete range of power modules and guidance features.



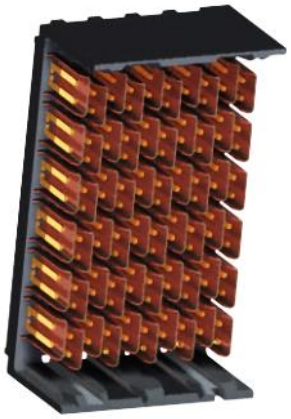
DC modules shown

B) MODULE OVERVIEW

BACKPLANE HEADER SIGNAL MODULES:



Right guided vertical module
(See SD-series-0004)



Open wall unguided vertical module
(See SD-series-0001)

Left guided vertical module
(See SD-series-0002)

Modules with closed end walls

Right guided vertical module
(See SD-series-0004)

(Note: one or both sides of
the housing can be closed)

Left guided vertical module
(See SD-series-0002)

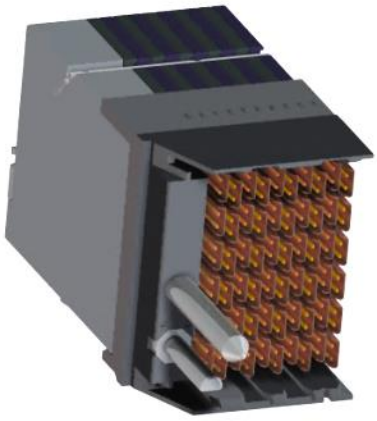
DAUGHTERCARD (DC) RECEPTACLE SIGNAL MODULES:

Left guided DC module
(See SD-series-0002)

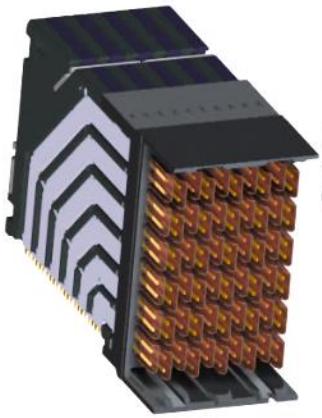
Unguided DC module
(See SD-series-0001)

Right guided DC module
(See SD-series-0004)

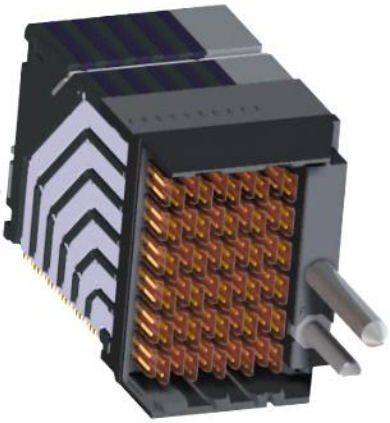
COPLANAR (RAM) SIGNAL MODULES:



Left guided RAM module
(See SD-series-0004)



Unguided RAM module
(See SD-series-0001)



Right guided RAM module
(See SD-series-0002)

RA POWER PLUG MODULES:

 With hold-down feature on the right	 With hold-down feature on the left

POWER RECEPTACLE MODULES:

 RA module with hold-down feature on the right	 RA module with hold-down feature on the left	 Vertical Module (For backplanes/mid-panes)

C) APPLICABLE DOCUMENTS

a. Product Specification:
Please refer to **PS-171320-999** or equivalent for the product specification.

b. Routing Guide:
Please refer to **AS-171320-990** for the routing guide.

c. Application Guideline for Installation:
Please refer to **1713209994-AS** for the application guideline for installation.

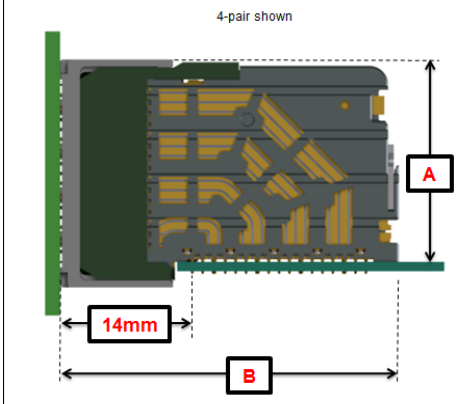
D) DISCLAIMER

Details included in the 2D sales drawings (SD-dwg) take precedence over information included in the Design Guide document.

II. CONNECTOR PHYSICAL ENVELOPE & SELECTION

A) TRADITIONAL BACKPLANE LAYOUT:

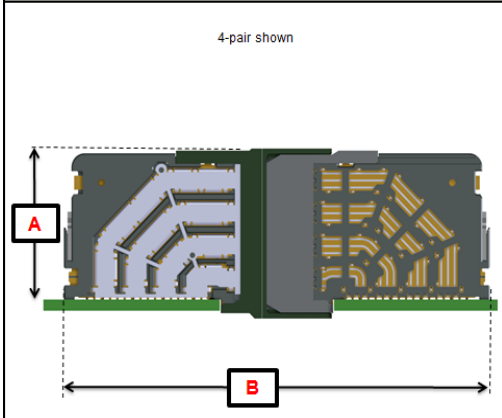
IMPEL - DC to Vertical Header: Physical size



DIM (mm)	2-pair	3-pair	4-pair	5-pair	6-pair
A	12.2mm	16.9mm	21.6mm	26.3mm	31.0mm
B	26.7mm	31.3mm	35.9mm	40.6mm	45.1mm
Diff Pair Count 14 Col Per Inch (on 1.9mm pitch)	27	40	54	66	80
Available # of columns*	contact Molex for available modules				
Available # of columns (3.0mm pitch) - quad rt.			limited availability		limited availability

B) COPLANAR LAYOUT:

IMPEL - Coplanar (RAM to DC): Physical size



DIM (mm)	2-pair	3-pair	4-pair	5-pair	6-pair
A	12.2mm	16.9mm	21.6mm	26.3mm	31.0mm
B	46.1mm	55.3mm	64.5mm	73.7mm	82.9mm
Diff Pair Count 14 Col Per Inch (on 1.9mm pitch)	27	40	54	66	80
Available # of columns*	contact Molex for available modules				
Available # of columns (3.0mm pitch) - quad rt.			limited availability		limited availability

C) CONNECTOR SELECTION:

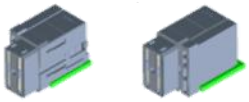
1. Signal Types:

- Differential Pairs for High Speed
- Single Ended pins for Low Speed
- Use the on line tool to help you with initial pin mapping:
  Click here to open Pin Mapping Configurator sheet

2. Power:

- For low voltage applications (under 30V), signal pins can be used. Each pin is rated 0.75A.
- For higher voltage and current applications, use dedicated power modules (see below):

High Power Modules:

Module:	[30A in/out]	[40A in/out]	[50A in/out]	[60A in/out]
RA Plug	 78347	 78349	 78351	 78353
Vertical Plug	 78399 (15mm)	Not Tooled	 78446 (22, 38, 40mm)	 78442
Vertical Recpt.	 78212	 78214	 78216	 78218
R/A Recpt.	 78348	 78350	In tooling process	Not Tooled
Current	15A / Blade 60A / Module	20A / Blade 80A / Module	25A / Blade 100A / Module	20A / Blade 120A / Module

*** Refer to sales drawing for latest tooling status***

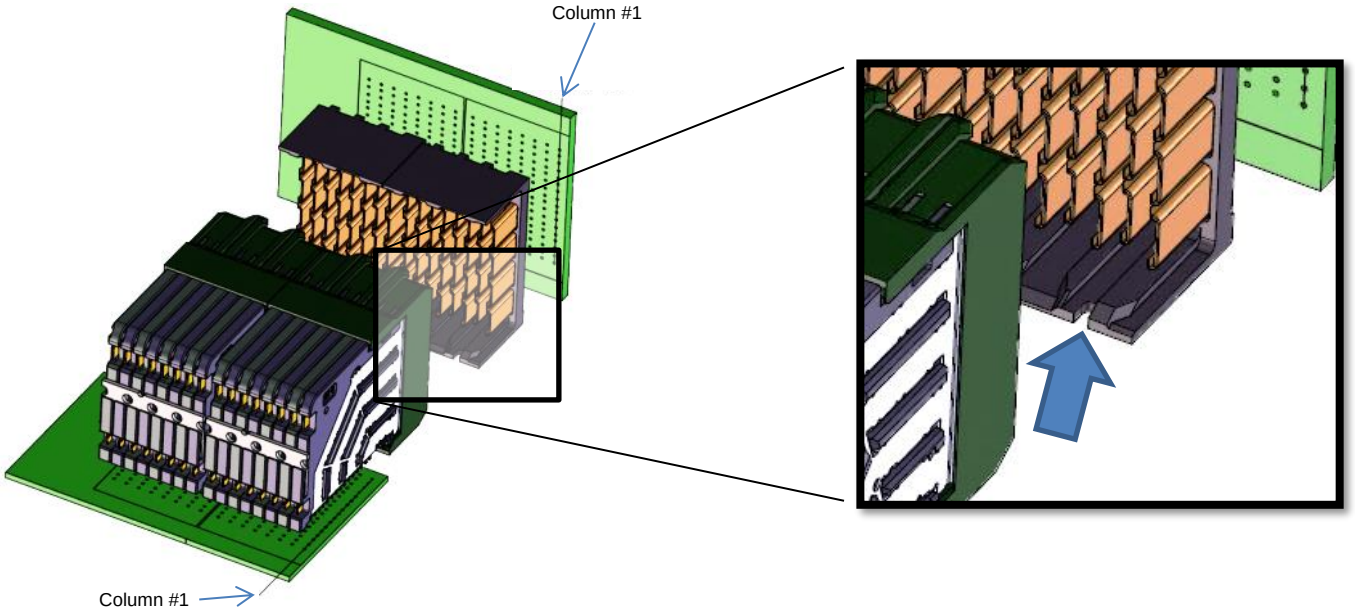
3. Plated Through Hole Dimension;

- Refer to AS-171320-990 for details regarding the required plated though hole and via construction. Impel™ modules utilize compliant tails that are designed for a 0.36mm diameter plated through hole. For thicker backplane boards (>7mm), header modules are available with compliant tails designed for a 0.46mm diameter plated through hole. Please contact Molex for recommendations.

III: MECHANICAL LAYOUT

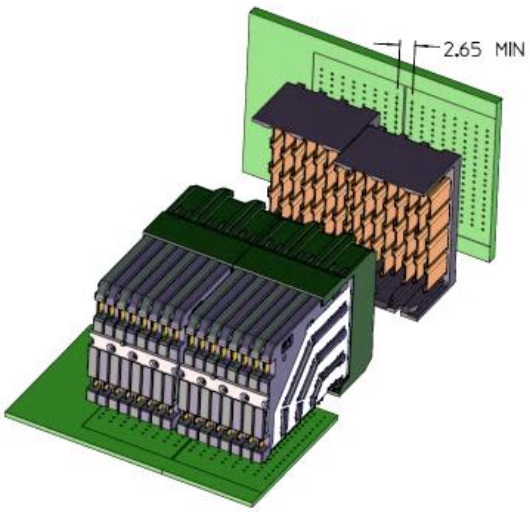
A) ESTABLISHING COLUMN #1 (HEADER)

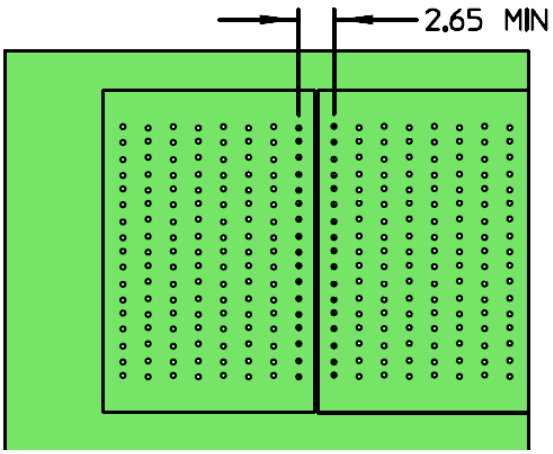
A small notch on the header housing indicates column #1.



B) SPACING BETWEEN MODULES

Use footprint to establish distance between adjacent modules. For standard 1.9mm pitch modules, the minimum distance between two adjacent modules is 2.65mm (column-to-column). For 3.0mm pitch modules, the minimum distance between two adjacent modules is 3.00mm (column-to-column). If headers with end-walls are used, add 1.4mm additional spacing for each plastic wall.





Backplane shown

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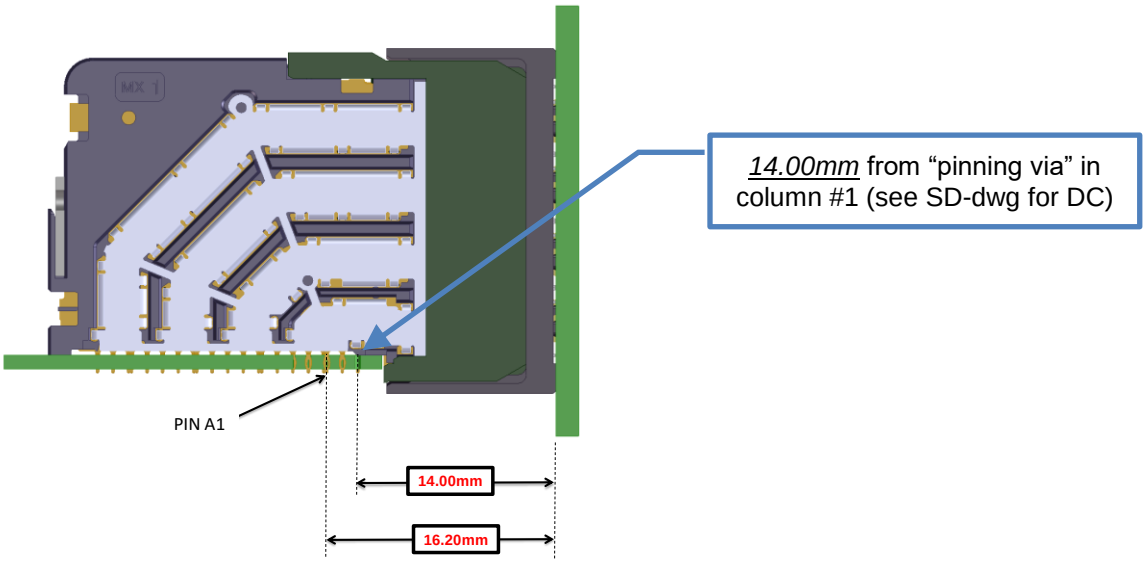
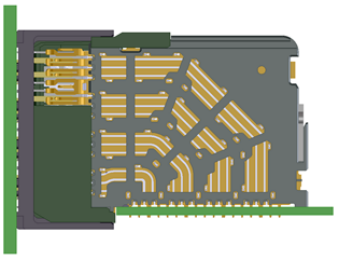
INITIAL APPR	JALEXANDER	DATE	2015/03/06				

C) FULLY MATED CONDITION:



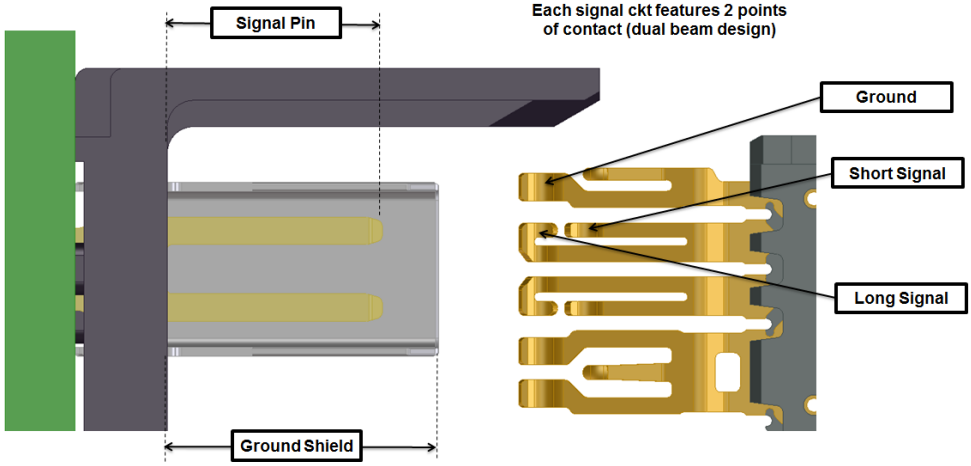
D) SIGNAL PIN LENGTHS AND MINIMUM WIPE

When the connector is fully seated, the minimum signal pins wipes are as follows:
(Note that Impel™ headers are available with two pin lengths: 4.9 and 5.5mm)



MINIMUM WIPE

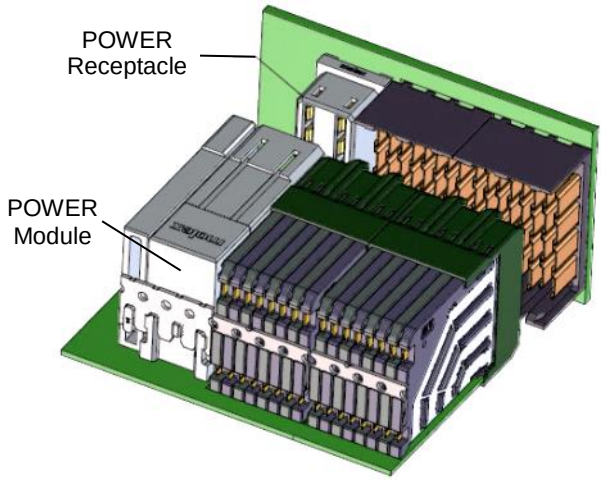
	Backplane Header or RAM Pin Lengths	
Daughtercard Mating Point	4.9mm Pin	5.5mm Pin
Ground	3.70 mm	3.70 mm
Long Signal	2.60 mm	3.20 mm
Short Signal	1.60 mm	2.20 mm

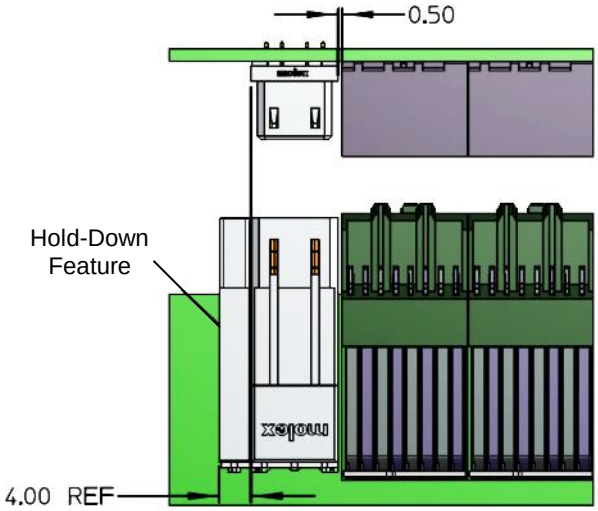


E) PAIRING IMPEL™ MODULE WITH POWER MODULES

1.) Right Angle to Vertical header

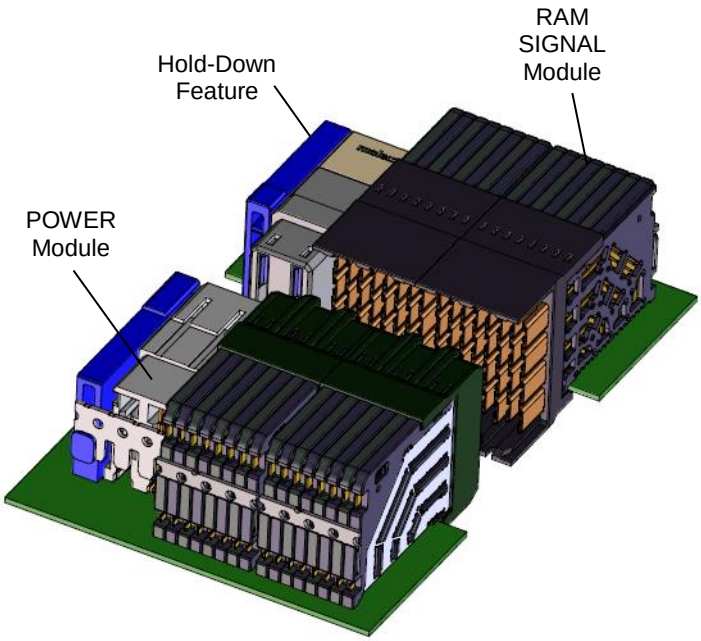
Molex recommends using the power modules that have a Hold-down feature on Line Card (LC) applications. Molex recommends 0.50mm spacing between the Power and Signal housings – allowing sufficient spacing for easy assembly processing. Note that on the LC side – Power modules require an extra 4.0mm due to the Hold-down feature. If signal modules on the backplane side feature end wall housings,1.4mm of extra space is required per plastic wall (refer to SD-dwg for keep out zone).

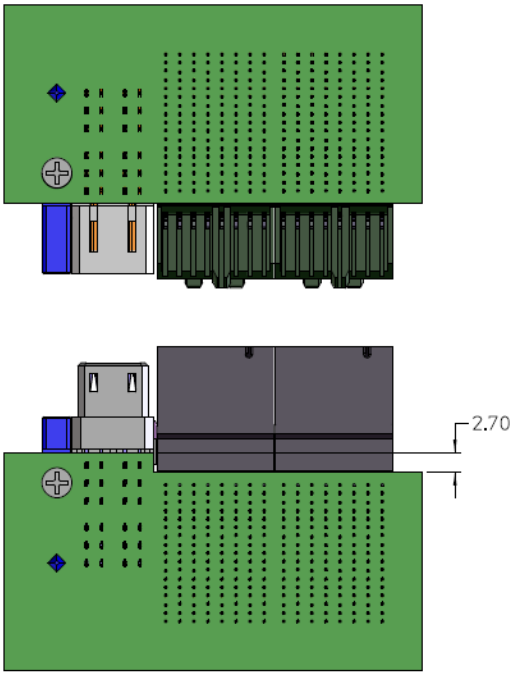




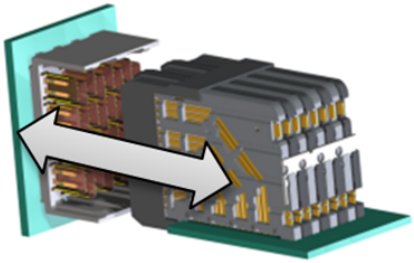
2.) Coplanar

Molex recommends using the power modules that have a Hold-down feature on Line Card (LC) applications. Molex recommends 0.50mm spacing between the Power and Signal housings – allowing sufficient spacing for easy assembly processing. RAM (Right Angle Male) Signal modules require a 2.70 notch in PCB.





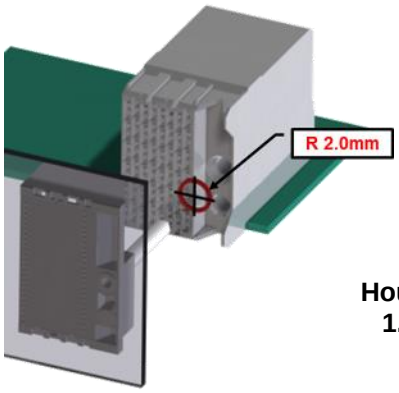
F) MATING FORCES / UN-MATING FORCES

IMPEL™ Signal Modules	Mating Force per Differential Pair	Un-Mating Force per Differential Pair
 (tested on 4-pair modules)	**By Specification**	
	200g max	45g min
	As Tested	
	146g max (4.9mm pin) 184g max (5.5mm pin)	60g min

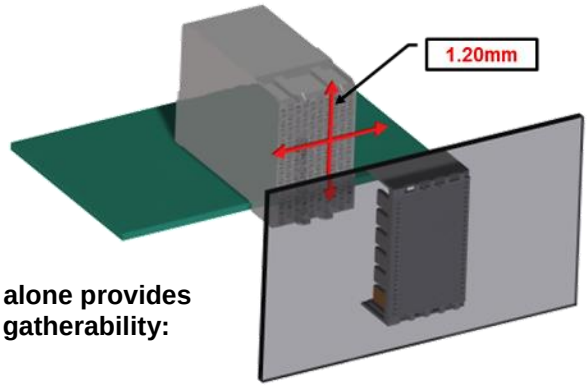
G) SYSTEM GATHERABILITY

The Impel™ connector system provides 2.0mm of gatherability when the integrated guides (pin and receptacle) are used. Without the integrated guides, the connector housings provide 1.2mm of gatherability.

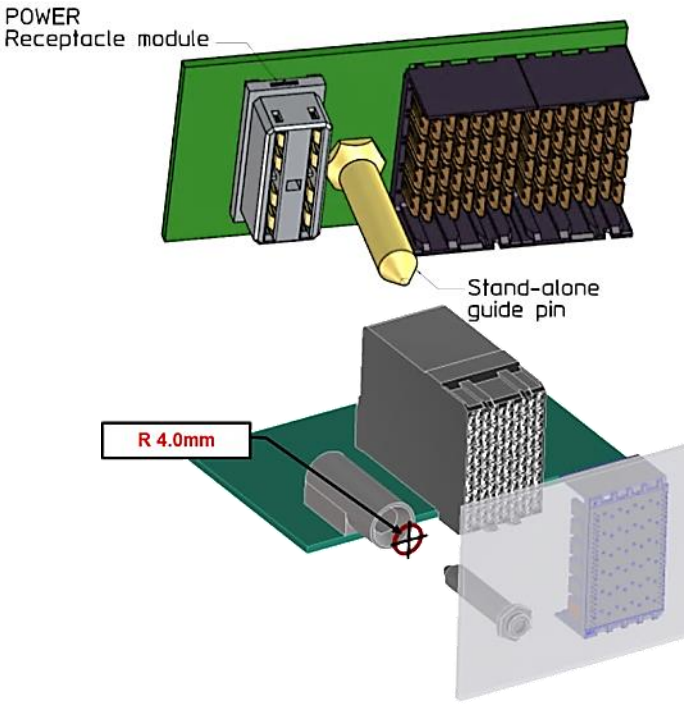
Gatherability when modules w/integrated guides are used:

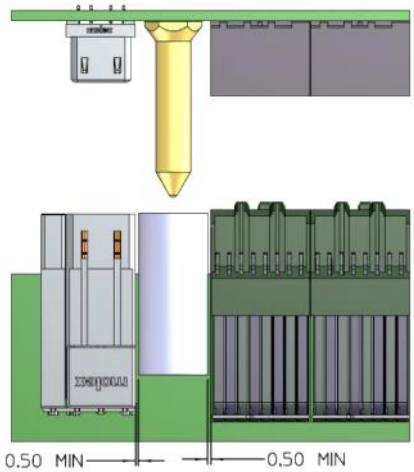


Housing alone provides 1.2mm gatherability:



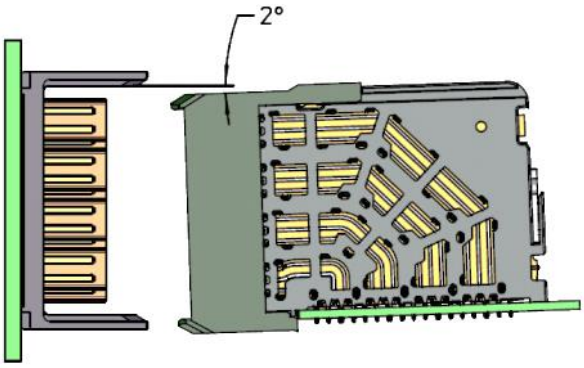
Stand-alone guide pins are available. Use LC side to establish the minimum spacing.
Molex recommends 0.5mm minimum spacing between signal/power modules and guiding components.
If a header with end walls is used, 1.4mm additional space is required per plastic wall (refer to SD-dwg for keep-out zone).



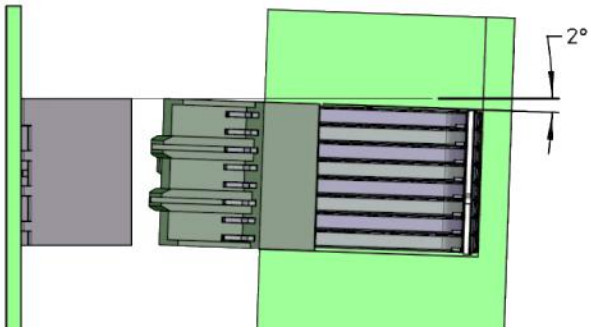


Nominal gatherability w/stand-alone guiding system:
(Guide pin p/n: 75234-0478
Guide block p/n: 76153-1001)

H) ANGULAR MATING:



Vertical Direction

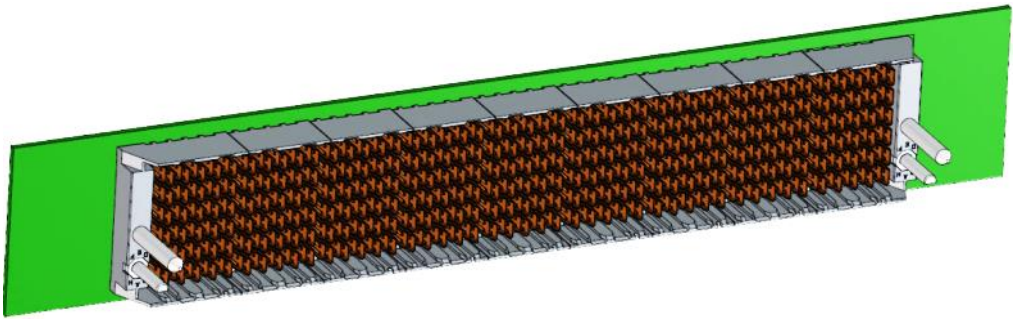


Horizontal Direction

IV. SYSTEM LEVEL RECOMMENDATIONS

A) USE OF GUIDING OPTIONS:

Molex recommends the use of integrated guide pins to insure proper mating. The overall connector span and the assembled card weight should be considered when determining the guidance. The following chart describes general guidance recommendations based on connector span and card weight.

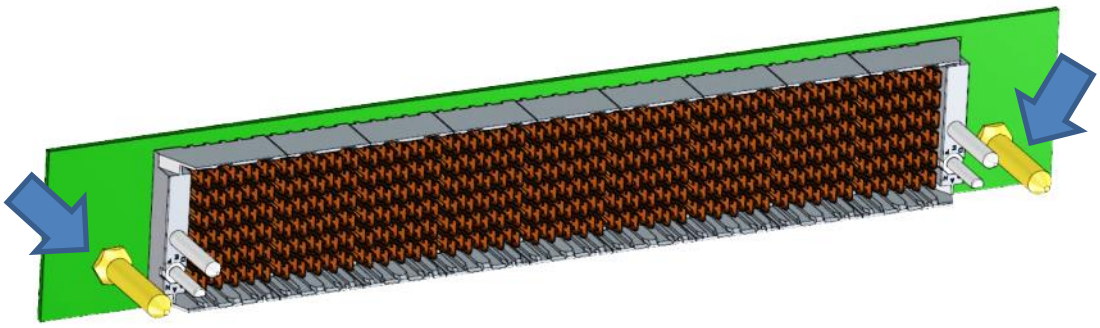


BP Connector Stack with Integrated Standard Guidance

GUIDE PIN RECOMMENDATIONS

DAUGHTERCARD CONNECTOR SPAN	DAUGHTERCARD WEIGHT	RECOMMENDED GUIDANCE (Minimum)
Less than 125mm	Less than 7 lbs	1 Standard Guide
	7 lbs – 14 lbs	2 Standard Guides or 1 Heavy Duty Guide
	14 lbs – 21 lbs	3 Standard Guides or 2 Heavy Duty Guides
	Over 21 lbs	Contact Molex Field Application Engineer
125mm – 250mm	Less than 14 lbs	2 Standard Guides

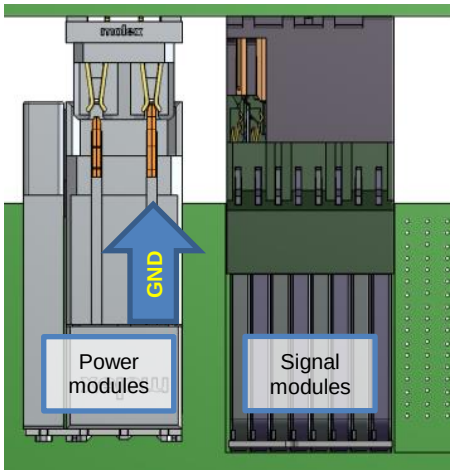
	14 lbs – 21 lbs	3 Standard Guides or 2 Heavy Duty Guides
	Over 21 lbs	Contact Molex Field Application Engineer
250mm – 375mm	Less than 21 lbs	3 Standard Guides
	Over 21 lbs	Contact Molex Field Application Engineer
Over 375mm	Any	Contact Molex Field Application Engineer



BP Connector Stack with Integrated Standard Guidance and Heavy Duty Guides

B) MATING SEQUENCE:

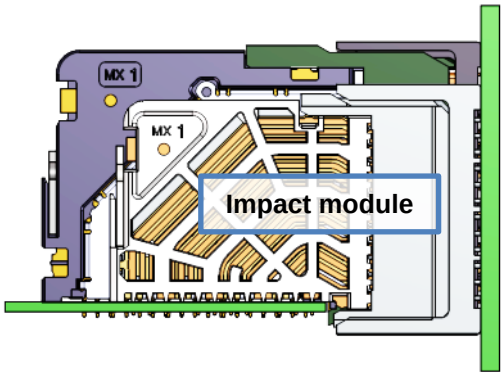
1. When paired with Power



Typical mating sequence with 4.9mm pins:

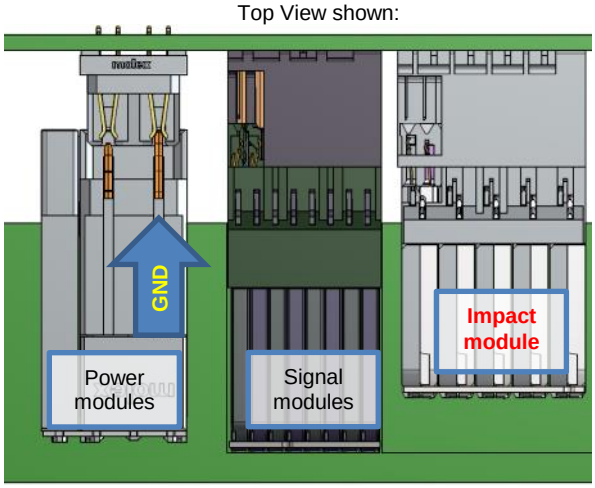
- **1st to mate is long power blade (GND)**
- **2nd to mate is GND shield of the signal module**
- **3rd to mate is short power blade (supply)**
- **Signal pins (diff-pairs) inside the signal module will mate last.**

2. When paired with Power and Impact modules.



Impact™ and Impel™ modules can be used side-by-side on a single LC. Note that Impel™ modules are taller than comparable Impact™ modules.

Top View shown:

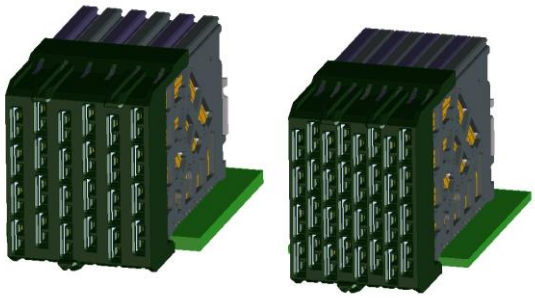


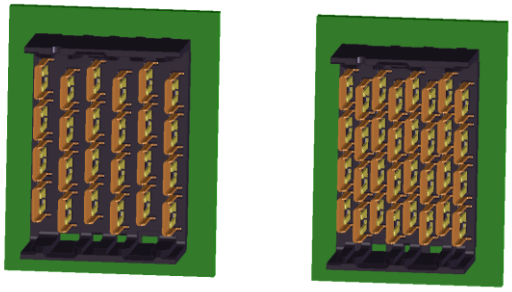
Typical mating sequence with 4.9mm pins:

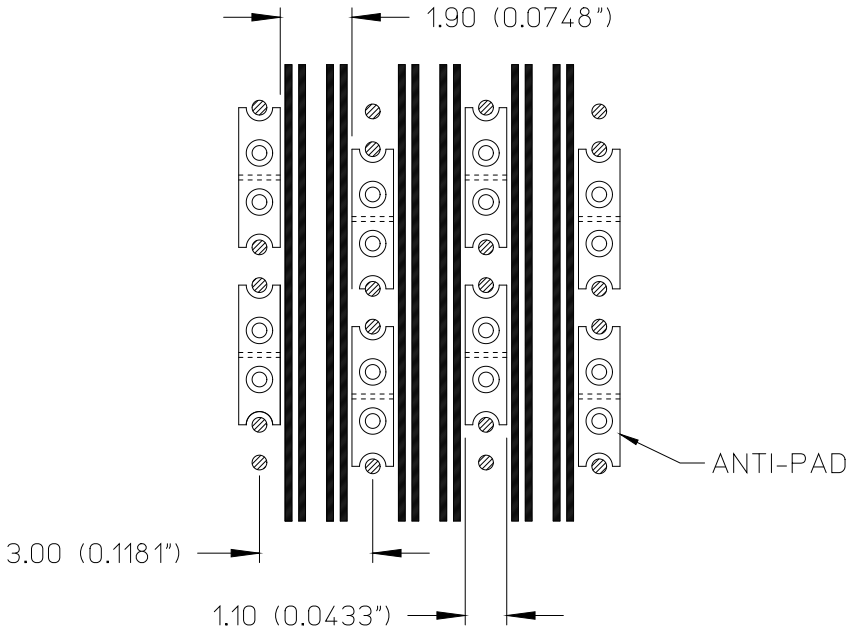
- **1st to mate is long power blade (GND).**
- **2nd to mate is GND shield of the Impel™ signal module.**
- **3rd to mate is short power blade (supply)**
- **4th to mate is GND ckt inside of Impact™ modules.**
- **Signal pins (diff-pairs) inside the Impel™ and Impact™ signal modules will mate last (with equivalent timing).**

C) QUAD ROUTEABLE MODULES:

Standard modules have 1.9mm column-to-column pitch. This spacing allows for one pair to be routed per column, per layer. Impel™ modules are also available with a wider 3.0mm pitch that allows routing of 2 pairs (4 tracks) of traces per column, per layer. Please contact Molex for availability:







Quad Route Example – Two Pairs Routed per Layer