
	<b>PRELIMINARY APPLICATION SPECIFICATION</b>	<b>NUMBER</b> <b>GS-20-094</b>		
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## 1. OBJECTIVE

This specification provides information and requirements for customer application of the ZipLine™ press-fit connectors including vertical headers and right angle receptacles. It is intended to provide general guidance for process development. It should be recognized that no single process will work under all customer applications and that customers should develop processes to meet individual needs. However, if the processes vary from the recommended one, FCI cannot guarantee acceptable results.

## 2. SCOPE

This specification provides information and requirements regarding application of ZipLine™ press-fit headers and receptacles to printed circuit boards (PCB's).

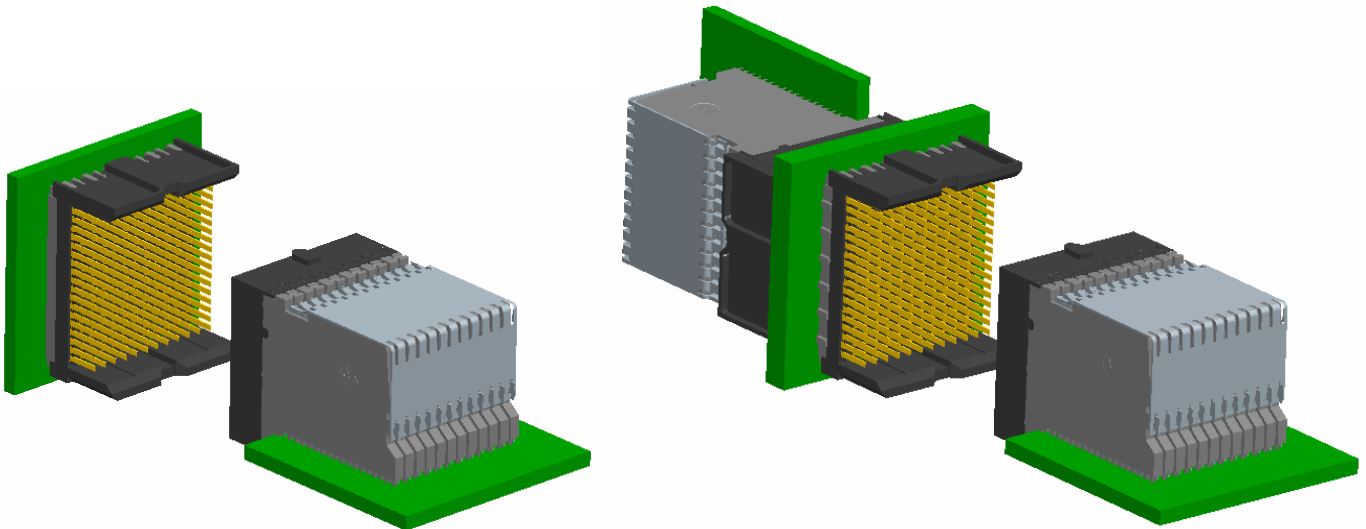



Figure 1: 216 position ZipLine™ signal connectors (backpanel and orthogonal configurations shown)

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### 3. APPLICABLE DOCUMENTS

- Applicable FCI product customer drawings
- FCI Product Specification GS-12-452 (ZipLine™ Connector System)
- FCI repair manuals **TBD** (similar to 430294-001 and 430284-001)
- FCI Product Specification GS-12-220 (2mm High Power Connector System)
- FCI Application Specification GS-20-023 (2mm High Power Connector System)
- FCI Application Specification GS-20-045 (Hard Metric Guide Connectors)

FCI product drawings and specifications are available by accessing the FCI website or by contacting FCI Technical Service. In the event of a conflict between this specification and the product drawing, the drawing takes precedence. Customers should refer to the latest revision level of FCI product drawings for appropriate product details.

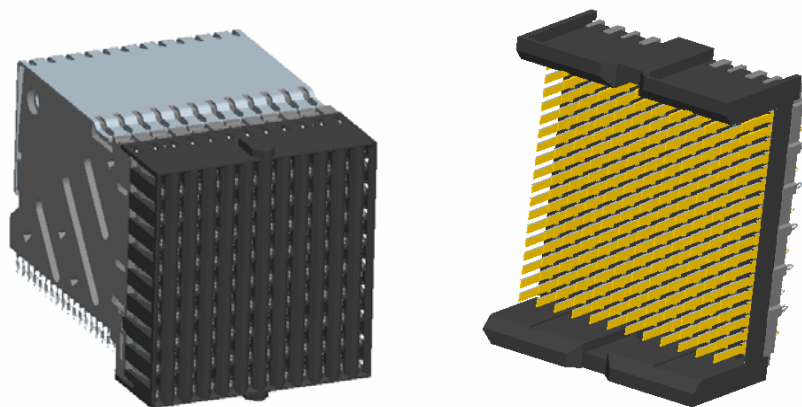
### 4. GENERAL CUSTOMER INFORMATION

This document is a general application guide. If there is a conflict between the product drawings and this specification, the drawings take precedence.


#### 4.1. CONNECTOR CONFIGURATIONS

ZipLine™ press-fit headers are offered in vertical backpanel header and vertical orthogonal header configurations. The mating interface is the same for backpanel and orthogonal midplane connectors. Compliant press-fit tails provide a reliable electrical connection between the ZipLine™ connectors and the plated through hole (PTH) of the PCB. Press-fit tails eliminate the need for soldering processing of through-board solder tails. Press-fit technology simplifies rework of assembled boards by allowing a damaged connector to be removed and replaced. Each connector may be replaced with a new connector 2 times without damaging the PCB.

The same ZipLine™ right angle receptacle will mate to any header with the same number of columns and the same number of rows.



**Figure 2: ZipLine™ 6 pair / 1.8 mm pitch / 12 column connector assemblies**

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#### 4.2. COMPATIBILITY WITH HARD METRIC PRODUCTS:

The ZipLine™ Connector System signal module is compatible with hard metric standards in that the distance between the backplane and front edge of the daughter card in backpanel applications is 12.5mm. See Figure 3 and Table 1 for dimensions relative to the daughter card.

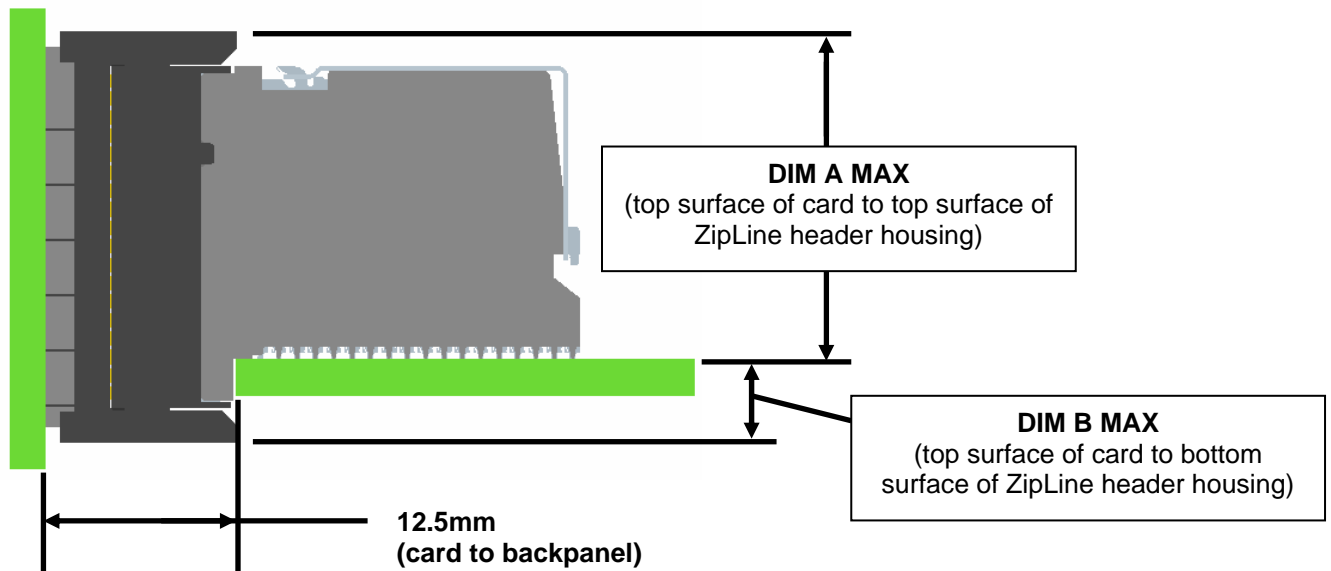



Figure 3: end view of the ZipLine™ Connector System (6 pair connectors shown)

Connector Height	Overall dimension of vertical header housing in direction of card pitch	DIM A	DIM B
6 pair	26.8mm	21.3mm	5.5mm

Table1: Connector dimensions relative to the daughter card

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### 4.3. CONTACT WIPE DISTANCE:

The nominal contact wipe distance for standard ZipLine™ signal and power pins is **2.6mm**. This value is at full normal force and does not include lead-in geometry on either mating half. This value assumes there is no gap between connector mating faces.

### 4.4. SIGNAL CONNECTOR GUIDING FEATURES:

Figure 4 shows the amount of misalignment in each direction that will be corrected by the guiding features on signal connector housings as they are mated.

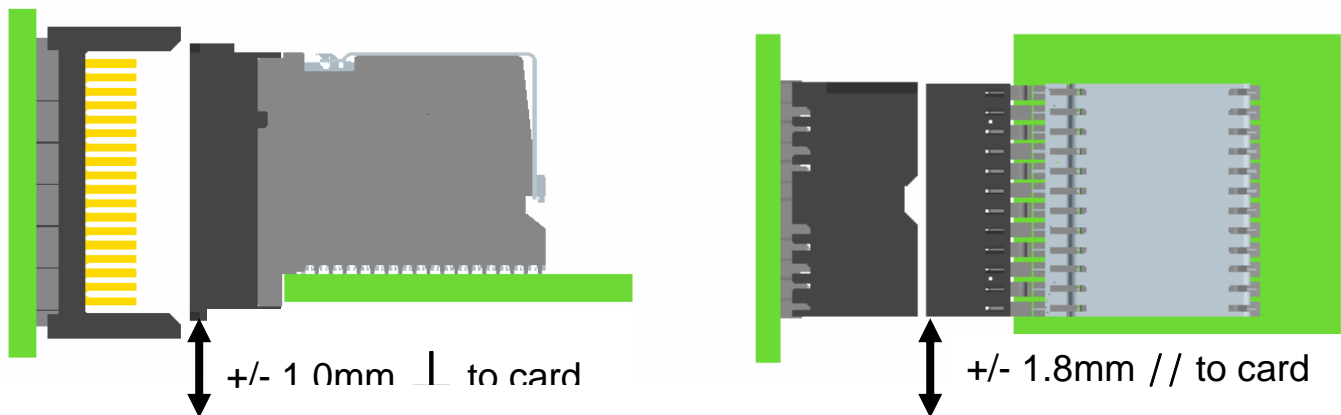



Figure 4: Connector guidance in each direction

The maximum acceptable angular misalignment of the daughter card relative to the backplane is  $\pm 2$  degrees in either direction.

### 4.5. SEPARATE GUIDE MODULES:

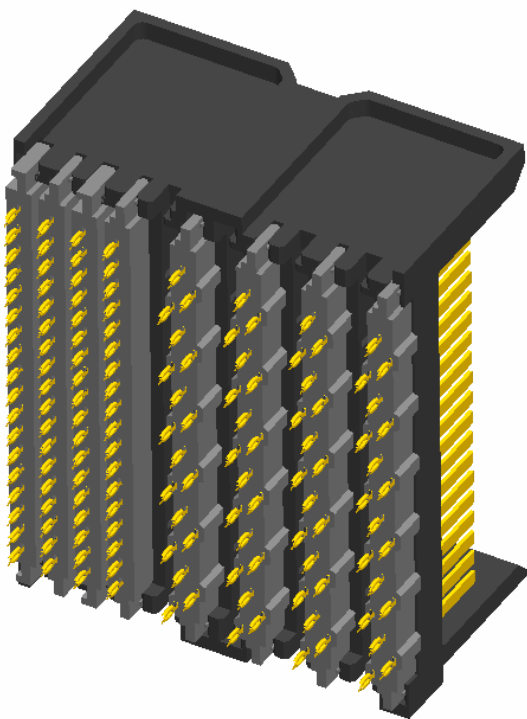
**It is strongly recommended that separate guide modules be used to maximize the system's mechanical robustness.** One guide module should be placed at each end of a group of signal modules. If the amount of bow in a daughter card is expected to exceed the amount of signal connector guidance, then an additional guide module should be placed near the center of a group of signal modules. **Please refer to GS-20-045 for additional information on Hard Metric Guide Connectors.**

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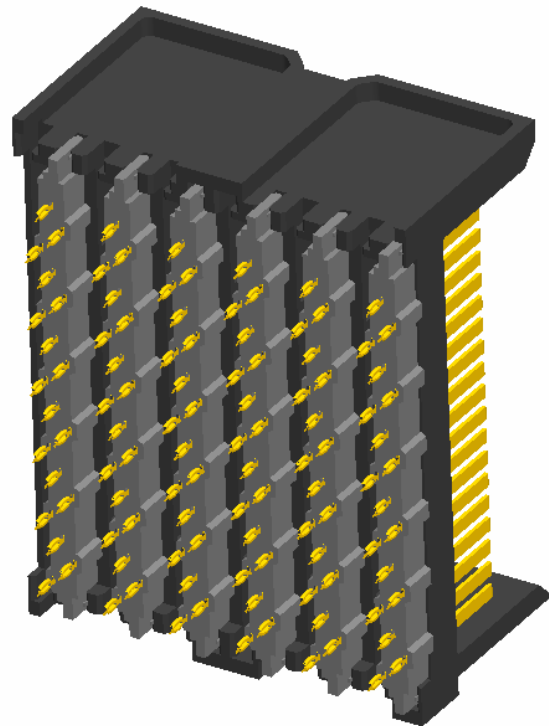
#### 4.6. FLEXIBLE SIGNAL IMLA LOADING:

Each column of a ZipLine™ connector is comprised of one Insert Molded Leadframe Assembly (IMLA). IMLA's may be configured to transmit either signal or power (see section 4.7 for information on power IMLA's). Signal IMLA's may have tails in line for standard backpanel applications or they may have jogged tails for shared via orthogonal midplane applications. Because all ZipLine™ header connectors use the same housing, it is possible to load a mix of standard backpanel signal IMLA's and shared hole midplane orthogonal signal IMLA's in the same assembly. Also, a standard backpanel connector can have every other column loaded to achieve a connector that is capable of routing 3 pairs of differential traces per column. For a 6 pair, 3.6mm pitch, 6 column configuration all pairs can be routed on 2 layers (see section 5.4 for a routing example).

Since all signal header IMLA's have the same mating interface design, the mating receptacle simply has to be loaded with IMLA's in the same columns as the mating header. See below for two examples of flexible signal IMLA loading:




**4 backpanel IMLA's on 1.8mm pitch +  
4 orthogonal IMLA's on 3.6mm pitch**



**6 orthogonal IMLA's on 3.6mm pitch**

**Figure 5: Examples of possible IMLA loading patterns**

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#### 4.7. INTEGRATED POWER IMLA's:

The power IMLA will have one power pin for each pair of signal connector height. For example, a power IMLA that fits into a 6 pair high signal connector will have 6 separate power pins. **The current carrying capacity of a single power pin is 2.5A with a fully loaded connector, 5.0A with 2 adjacent power IMLA's (as shown in Figure 6), and 7.0A with a single power IMLA (as shown in Figure 7). The maximum voltage that may be present on these power pins is 12V.** The power IMLA will be molded in a natural color to visually differentiate it from the black signal IMLA's. See Figures 5 and 6 for two possible configurations of signal and power within the same connector. These both use standard 12 column wide housings.

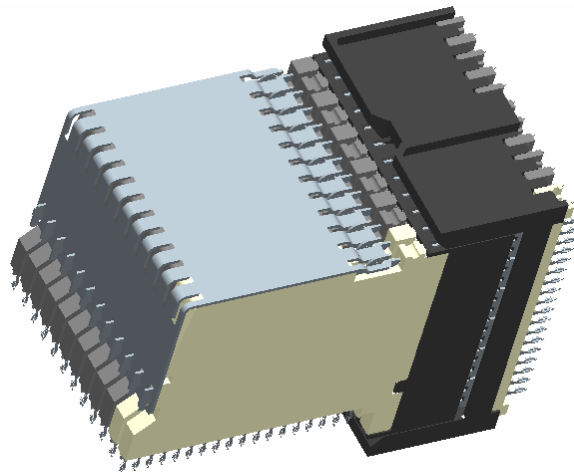


Figure 6: 10 signal IMLA's + 2 power IMLA's, all on 1.8mm column pitch

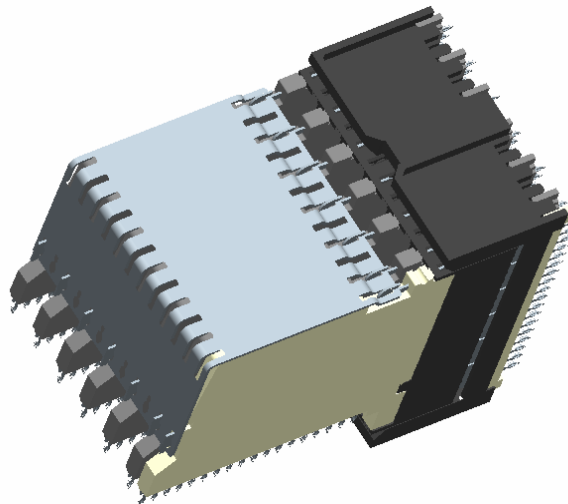



Figure 7: 6 signal IMLA's on 3.6mm column pitch + 1 power IMLA

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## 5. RECOMMENDATIONS FOR CUSTOMER PCB LAYOUT

### 5.1. DIFFERENTIAL PAIR vs. SINGLE-ENDED LAYOUTS

The same ZipLine™ connector may be used for differential pair and single-ended signals. Differential and single-ended pin assignments may be mixed within the same column. It is recommended that the customer review any mixed layout with FCI to optimize high-speed performance.

### 5.2. PIN ASSIGNMENTS FOR ORTHOGONAL HEADER FOOTPRINTS (90° clockwise)

ZipLine™ orthogonal headers have offset press-fit tails so each differential pair on one side of the orthogonal midplane will share the same PCB via's as a differential pair on the other side of the midplane. Therefore no high speed routing is required on the midplane which allows for layer count and cost minimization of the midplane. Tables 2a and 2b list which pins are directly connected through PCB via's for the 72 pair (6 pair X 12 column) orthogonal configuration when the rear side daughter card is oriented 90 clockwise relative to the front side daughter card. Table 3 lists which signal pins are directly connected through PCB via's for the 36 pair (6 pair X 6 column) orthogonal configuration.

For example in Table 2a, pin G5 on the front side of the midplane will connect directly to pin H5 on the rear side of the midplane. For the 36 position orthogonal connections shown in Table 3, the ground pins are not directly connected through the same via from front to back, but will be connected through ground planes in the midplane.

Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Pin Type
A 1	B 1	A 3	E 1	A 5	H 1	A 7	K 1	A 9	N 1	A 11	Q 1	S
B 1	A 1	B 3	D 1	B 5	G 1	B 7	J 1	B 9	M 1	B 11	P 1	S
C 1	A 2	C 3	D 2	C 5	G 2	C 7	J 2	C 9	M 2	C 11	P 2	G
D 1	B 3	D 3	E 3	D 5	H 3	D 7	K 3	D 9	N 3	D 11	Q 3	S
E 1	A 3	E 3	D 3	E 5	G 3	E 7	J 3	E 9	M 3	E 11	P 3	S
F 1	A 4	F 3	D 4	F 5	G 4	F 7	J 4	F 9	M 4	F 11	P 4	G
G 1	B 5	G 3	E 5	G 5	H 5	G 7	K 5	G 9	N 5	G 11	Q 5	S
H 1	A 5	H 3	D 5	H 5	G 5	H 7	J 5	H 9	M 5	H 11	P 5	S
I 1	A 6	I 3	D 6	I 5	G 6	I 7	J 6	I 9	M 6	I 11	P 6	G
J 1	B 7	J 3	E 7	J 5	H 7	J 7	K 7	J 9	N 7	J 11	Q 7	S
K 1	A 7	K 3	D 7	K 5	G 7	K 7	J 7	K 9	M 7	K 11	P 7	S
L 1	A 8	L 3	D 8	L 5	G 8	L 7	J 8	L 9	M 8	L 11	P 8	G
M 1	B 9	M 3	E 9	M 5	H 9	M 7	K 9	M 9	N 9	M 11	Q 9	S
N 1	A 9	N 3	D 9	N 5	G 9	N 7	J 9	N 9	M 9	N 11	P 9	S
O 1	A 10	O 3	D 10	O 5	G 10	O 7	J 10	O 9	M 10	O 11	P 10	G
P 1	B 11	P 3	E 11	P 5	H 11	P 7	K 11	P 9	N 11	P 11	Q 11	S
Q 1	A 11	Q 3	D 11	Q 5	G 11	Q 7	J 11	Q 9	M 11	Q 11	P 11	S
R 1	A 12	R 3	D 12	R 5	G 12	R 7	J 12	R 9	M 12	R 11	P 12	G

Table 2a: Pin connections for odd numbered columns in a ZipLine™ 72 pair orthogonal header



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Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Pin Type
A 2	C 1	A 4	F 1	A 6	I 1	A 8	L 1	A 10	O 1	A 12	R 1	G
B 2	B 2	B 4	E 2	B 6	H 2	B 8	K 2	B 10	N 2	B 12	Q 2	S
C 2	C 2	C 4	F 2	C 6	I 2	C 8	L 2	C 10	O 2	C 12	R 2	S
D 2	C 3	D 4	F 3	D 6	I 3	D 8	L 3	D 10	O 3	D 12	R 3	G
E 2	B 4	E 4	E 4	E 6	H 4	E 8	K 4	E 10	N 4	E 12	Q 4	S
F 2	C 4	F 4	F 4	F 6	I 4	F 8	L 4	F 10	O 4	F 12	R 4	S
G 2	C 5	G 4	F 5	G 6	I 5	G 8	L 5	G 10	O 5	G 12	R 5	G
H 2	B 6	H 4	E 6	H 6	H 6	H 8	K 6	H 10	N 6	H 12	Q 6	S
I 2	C 6	I 4	F 6	I 6	I 6	I 8	L 6	I 10	O 6	I 12	R 6	S
J 2	C 7	J 4	F 7	J 6	I 7	J 8	L 7	J 10	O 7	J 12	R 7	G
K 2	B 8	K 4	E 8	K 6	H 8	K 8	K 8	K 10	N 8	K 12	Q 8	S
L 2	C 8	L 4	F 8	L 6	I 8	L 8	L 8	L 10	O 8	L 12	R 8	S
M 2	C 9	M 4	F 9	M 6	I 9	M 8	L 9	M 10	O 9	M 12	R 9	G
N 2	B 10	N 4	E 10	N 6	H 10	N 8	K 10	N 10	N 10	N 12	Q 10	S
O 2	C 10	O 4	F 10	O 6	I 10	O 8	L 10	O 10	O 10	O 12	R 10	S
P 2	C 11	P 4	F 11	P 6	I 11	P 8	L 11	P 10	O 11	P 12	R 11	G
Q 2	B 12	Q 4	E 12	Q 6	H 12	Q 8	K 12	Q 10	N 12	Q 12	Q 12	S
R 2	C 12	R 4	F 12	R 6	I 12	R 8	L 12	R 10	O 12	R 12	R 12	S

Table 2b: Pin connections for even numbered columns in a ZipLine™ 72 pair orthogonal header

Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Pin Type
A 1	B 1	A 2	E 1	A 3	H 1	A 4	K 1	A 5	N 1	A 6	Q 1	S
B 1	A 1	B 2	D 1	B 3	G 1	B 4	J 1	B 5	M 1	B 6	P 1	S
C 1	none	C 2	none	C 3	none	C 4	none	C 5	none	C 6	none	G
none	C 1	none	F 1	none	I 1	none	L 1	none	O 1	none	R 1	G
D 1	B 2	D 2	E 2	D 3	H 2	D 4	K 2	D 5	N 2	D 6	Q 2	S
E 1	A 2	E 2	D 2	E 3	G 2	E 4	J 2	E 5	M 2	E 6	P 2	S
F 1	none	F 2	none	F 3	none	F 4	none	F 5	none	F 6	none	G
none	C 2	none	F 2	none	I 2	none	L 2	none	O 2	none	R 2	G
G 1	B 3	G 2	E 3	G 3	H 3	G 4	K 3	G 5	N 3	G 6	Q 3	S
H 1	A 3	H 2	D 3	H 3	G 3	H 4	J 3	H 5	M 3	H 6	P 3	S
I 1	none	I 2	none	I 3	none	I 4	none	I 5	none	I 6	none	G
none	C 3	none	F 3	none	I 3	none	L 3	none	O 3	none	R 3	G
J 1	B 4	J 2	E 4	J 3	H 4	J 4	K 4	J 5	N 4	J 6	Q 4	S
K 1	A 4	K 2	D 4	K 3	G 4	K 4	J 4	K 5	M 4	K 6	P 4	S
L 1	none	L 2	none	L 3	none	L 4	none	L 5	none	L 6	none	G
none	A 4	none	F 4	none	I 4	none	L 4	none	O 4	none	R 4	G
M 1	B 5	M 2	E 5	M 3	H 5	M 4	K 5	M 5	N 5	M 6	Q 5	S
N 1	A 5	N 2	D 5	N 3	G 5	N 4	J 5	N 5	M 5	N 6	P 5	S
O 1	none	O 2	none	O 3	none	O 4	none	O 5	none	O 6	none	G
none	C 5	none	F 5	none	I 5	none	L 5	none	O 5	none	R 5	G
P 1	B 6	P 2	E 6	P 3	H 6	P 4	K 6	P 5	N 6	P 6	Q 6	S
Q 1	A 6	Q 2	D 6	Q 3	G 6	Q 4	J 6	Q 5	M 6	Q 6	P 6	S
R 1	none	R 2	none	R 3	none	R 4	none	R 5	none	R 6	none	G
none	C 6	none	F 6	none	I 6	none	L 6	none	O 6	none	R 6	G

Table 3: Pin connections for all columns in a ZipLine™ 36 pair orthogonal header

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### 5.3. PIN ASSIGNMENTS FOR ORTHOGONAL HEADER FOOTPRINTS (270° clockwise)

Tables 4a and 4b list which pins are directly connected through PCB via's for the 72 pair (6 pair X 12 column) orthogonal configuration when the rear side daughter card is oriented 270 clockwise (or 90 degrees counter clockwise) relative to the front side daughter card. Table 5 lists which signal pins are directly connected through PCB via's for the 36 pair (6 pair X 6 column) orthogonal configuration.

**NOTE 1.** ZipLine 72 pair orthogonal connectors may be mated such that r/a receptacle pin A1 mates to vertical header pin A1 OR such that r/a receptacle pin A1 mates to vertical header pin R12 as long as there are no features that make the mating header pin field asymmetrical.

**NOTE 2.** ZipLine 36 pair orthogonal connectors require that r/a receptacle pin A1 mate to vertical header pin A1, so to accomplish the connections as shown in Table 5 below, the PCB layout will be different than that shown on the customer drawing.

Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Pin Type
A 1	Q 12	A 3	N 12	A 5	K 12	A 7	H 12	A 9	E 12	A 11	B 12	S
B 1	R 12	B 3	O 12	B 5	L 12	B 7	I 12	B 9	F 12	B 11	C 12	S
C 1	R 11	C 3	O 11	C 5	L 11	C 7	I 11	C 9	F 11	C 11	C 11	G
D 1	Q 10	D 3	N 10	D 5	K 10	D 7	H 10	D 9	E 10	D 11	B 10	S
E 1	R 10	E 3	O 10	E 5	L 10	E 7	I 10	E 9	F 10	E 11	C 10	S
F 1	R 9	F 3	O 9	F 5	L 9	F 7	I 9	F 9	F 9	F 11	C 9	G
G 1	Q 8	G 3	N 8	G 5	K 8	G 7	H 8	G 9	E 8	G 11	B 8	S
H 1	R 8	H 3	O 8	H 5	L 8	H 7	I 8	H 9	F 8	H 11	C 8	S
I 1	R 7	I 3	O 7	I 5	L 7	I 7	I 7	I 9	F 7	I 11	C 7	G
J 1	Q 6	J 3	N 6	J 5	K 6	J 7	H 6	J 9	E 6	J 11	B 6	S
K 1	R 6	K 3	O 6	K 5	L 6	K 7	I 6	K 9	F 6	K 11	C 6	S
L 1	R 5	L 3	O 5	L 5	L 5	L 7	I 5	L 9	F 5	L 11	C 5	G
M 1	Q 4	M 3	N 4	M 5	K 4	M 7	H 4	M 9	E 4	M 11	B 4	S
N 1	R 4	N 3	O 4	N 5	L 4	N 7	I 4	N 9	F 4	N 11	C 4	S
O 1	R 3	O 3	O 3	O 5	L 3	O 7	I 3	O 9	F 3	O 11	C 3	G
P 1	Q 2	P 3	N 2	P 5	K 2	P 7	H 2	P 9	E 2	P 11	B 2	S
Q 1	R 2	Q 3	O 2	Q 5	L 2	Q 7	I 2	Q 9	F 2	Q 11	C 2	S
R 1	R 1	R 3	O 1	R 5	L 1	R 7	I 1	R 9	F 1	R 11	C 1	G

Table 4a: Pin connections for odd numbered columns in a ZipLine™ 72 pair orthogonal header, 270 degree clockwise rotation between front and rear side cards (SEE NOTE 1)



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Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Pin Type
A 2	P 12	A 4	M 12	A 6	J 12	A 8	G 12	A 10	D 12	A 12	A 12	G
B 2	Q 11	B 4	N 11	B 6	K 11	B 8	H 11	B 10	E 11	B 12	B 11	S
C 2	P 11	C 4	M 11	C 6	J 11	C 8	G 11	C 10	D 11	C 12	A 11	S
D 2	P 10	D 4	M 10	D 6	J 10	D 8	G 10	D 10	D 10	D 12	A 10	G
E 2	Q 9	E 4	N 9	E 6	K 9	E 8	H 9	E 10	E 9	E 12	B 9	S
F 2	P 9	F 4	M 9	F 6	J 9	F 8	G 9	F 10	D 9	F 12	A 9	S
G 2	P 8	G 4	M 8	G 6	J 8	G 8	G 8	G 10	D 8	G 12	A 8	G
H 2	Q 7	H 4	N 7	H 6	K 7	H 8	H 7	H 10	E 7	H 12	B 7	S
I 2	P 7	I 4	M 7	I 6	J 7	I 8	G 7	I 10	D 7	I 12	A 7	S
J 2	P 6	J 4	M 6	J 6	J 6	J 8	G 6	J 10	D 6	J 12	A 6	G
K 2	Q 5	K 4	N 5	K 6	K 5	K 8	H 5	K 10	E 5	K 12	B 5	S
L 2	P 5	L 4	M 5	L 6	J 5	L 8	G 5	L 10	D 5	L 12	A 5	S
M 2	P 4	M 4	M 4	M 6	J 4	M 8	G 4	M 10	D 4	M 12	A 4	G
N 2	Q 3	N 4	N 3	N 6	K 3	N 8	H 3	N 10	E 3	N 12	B 3	S
O 2	P 3	O 4	M 3	O 6	J 3	O 8	G 3	O 10	D 3	O 12	A 3	S
P 2	P 2	P 4	M 2	P 6	J 2	P 8	G 2	P 10	D 2	P 12	A 2	G
Q 2	Q 1	Q 4	N 1	Q 6	K 1	Q 8	H 1	Q 10	E 1	Q 12	B 1	S
R 2	P 1	R 4	M 1	R 6	J 1	R 8	G 1	R 10	D 1	R 12	A 1	S

Table 4b: Pin connections for even numbered columns in a ZipLine™ 72 pair orthogonal header, 270 degree clockwise rotation between front and rear side cards (SEE NOTE 1)

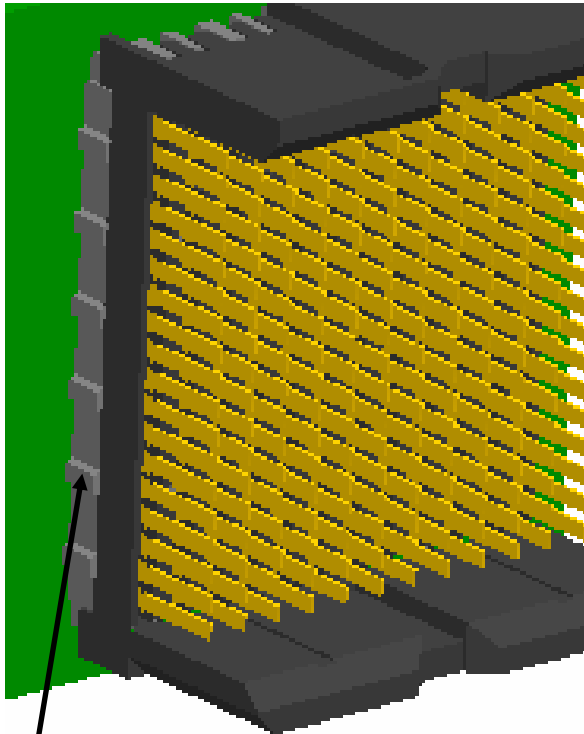
Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear	Pin Type
A 1	P 6	A 2	M 6	A 3	J 6	A 4	G 6	A 5	D 6	A 6	A 6	S
B 1	Q 6	B 2	N 6	B 3	K 6	B 4	H 6	B 5	E 6	B 6	B 6	S
C 1	none	C 2	none	C 3	none	C 4	none	C 5	none	C 6	none	G
none	R 6	none	O 6	none	L 6	none	I 6	none	F 6	none	C 6	G
D 1	P 5	D 2	M 5	D 3	J 5	D 4	G 5	D 5	D 5	D 6	A 5	S
E 1	Q 5	E 2	N 5	E 3	K 5	E 4	H 5	E 5	E 5	E 6	B 5	S
F 1	none	F 2	none	F 3	none	F 4	none	F 5	none	F 6	none	G
none	R 5	none	O 5	none	L 5	none	I 5	none	F 5	none	C 5	G
G 1	P 4	G 2	M 4	G 3	J 4	G 4	G 4	G 5	D 4	G 6	A 4	S
H 1	Q 4	H 2	N 4	H 3	K 4	H 4	H 4	H 5	E 4	H 6	B 4	S
I 1	none	I 2	none	I 3	none	I 4	none	I 5	none	I 6	none	G
none	R 4	none	O 4	none	L 4	none	I 4	none	F 4	none	C 4	G
J 1	P 3	J 2	M 3	J 3	J 3	J 4	G 3	J 5	D 3	J 6	A 3	S
K 1	Q 3	K 2	N 3	K 3	K 3	K 4	H 3	K 5	E 3	K 6	B 3	S
L 1	none	L 2	none	L 3	none	L 4	none	L 5	none	L 6	none	G
none	R 3	none	O 3	none	L 3	none	I 3	none	F 3	none	C 3	G
M 1	P 2	M 2	M 2	M 3	J 2	M 4	G 2	M 5	D 2	M 6	A 2	S
N 1	Q 2	N 2	N 2	N 3	K 2	N 4	H 2	N 5	E 2	N 6	B 2	S
O 1	none	O 2	none	O 3	none	O 4	none	O 5	none	O 6	none	G
none	R 2	none	O 2	none	L 2	none	I 2	none	F 2	none	C 2	G
P 1	P 1	P 2	M 1	P 3	J 1	P 4	G 1	P 5	D 1	P 6	A 1	S
Q 1	Q 1	Q 2	N 1	Q 3	K 1	Q 4	H 1	Q 5	E 1	Q 6	B 1	S
R 1	none	R 2	none	R 3	none	R 4	none	R 5	none	R 6	none	G
none	R 1	none	O 1	none	L 1	none	I 1	none	F 1	none	C 1	G

Table 5: Pin connections for all columns in a ZipLine™ 36 pair orthogonal header, 270 degree clockwise rotation between front and rear side cards (SEE NOTE 2)

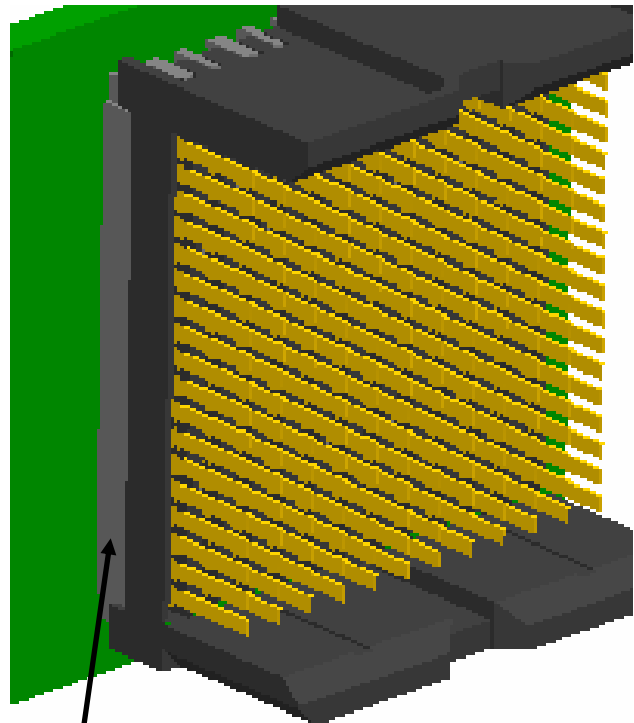
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#### 5.4. PLACING A BACKPANEL HEADER NEXT TO AN ORTHOGONAL HEADER


For PCB layouts where a standard backpanel header module must be placed directly next to an orthogonal header module, an extra 0.2mm clearance must be added between the two connectors due to the protruding features found on the orthogonal header IMLA. See below for clarification.



Protrusions are present on each side of an orthogonal header – must add 0.2mm extra space to avoid interference



No protrusions are present on a standard backpanel header

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### 5.5. PCB TRACE ROUTING, 1.8 mm column pitch

For backpanel header and for any daughtercard connector, the 3.6 mm pitch between columns allows three differential pair or six single-ended lines to be routed per PCB layer. Refer to Figure 9 for a trace routing example (all dimensions are in mm). If a customer chooses to use narrower traces and/or spaces between traces tha

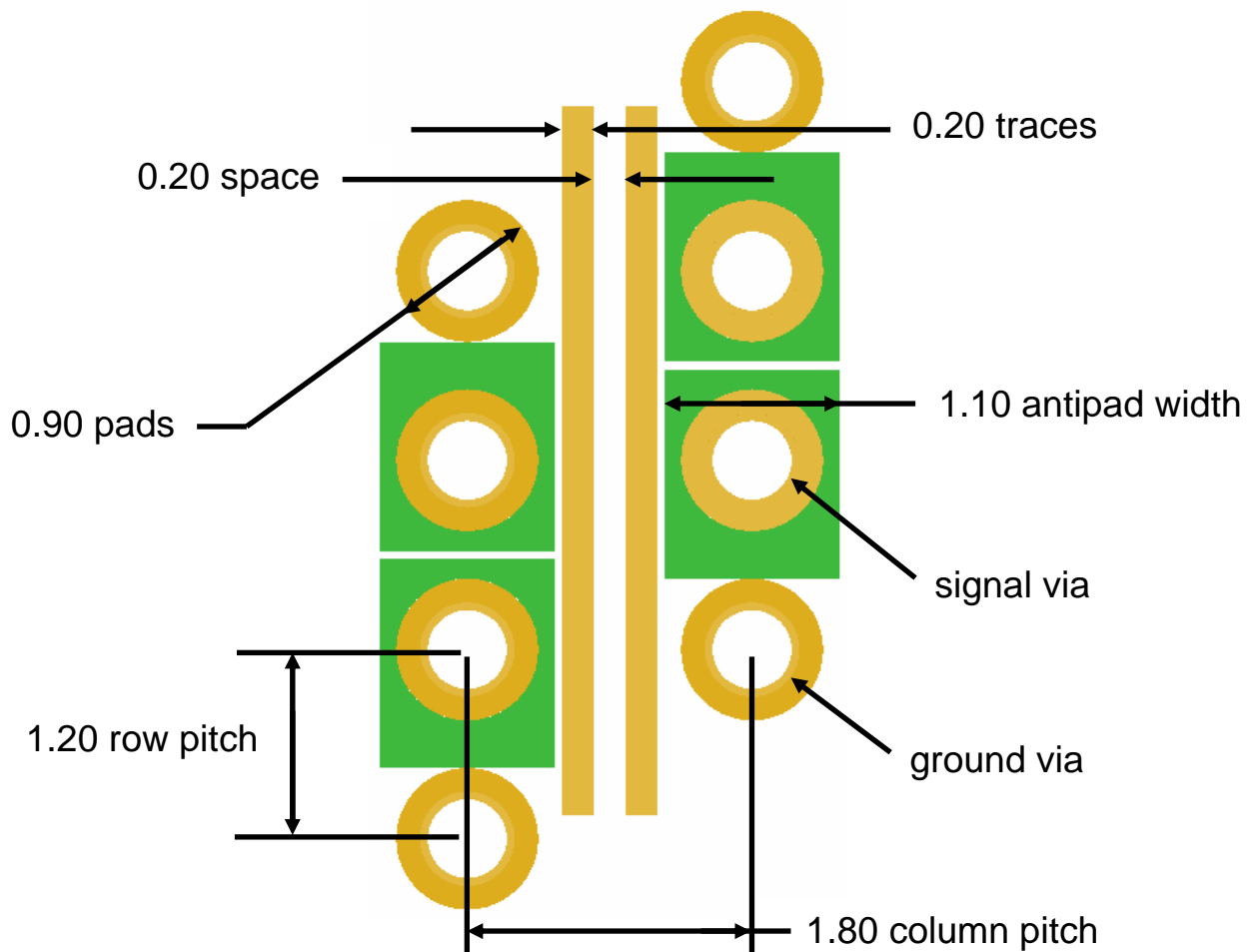



Figure 8: PCB trace routing example, 1.8 mm pitch between columns

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### 5.6. PCB TRACE ROUTING, 3.6 mm column pitch

For backpanel header and for any daughtercard connector, the 3.6 mm pitch between columns allows three differential pair or six single-ended lines to be routed per PCB layer. Refer to Figure 9 for a trace routing example (all dimensions are in mm). If a customer chooses to use narrower traces and/or spaces between traces than shown, then the antipad width can be increased accordingly.

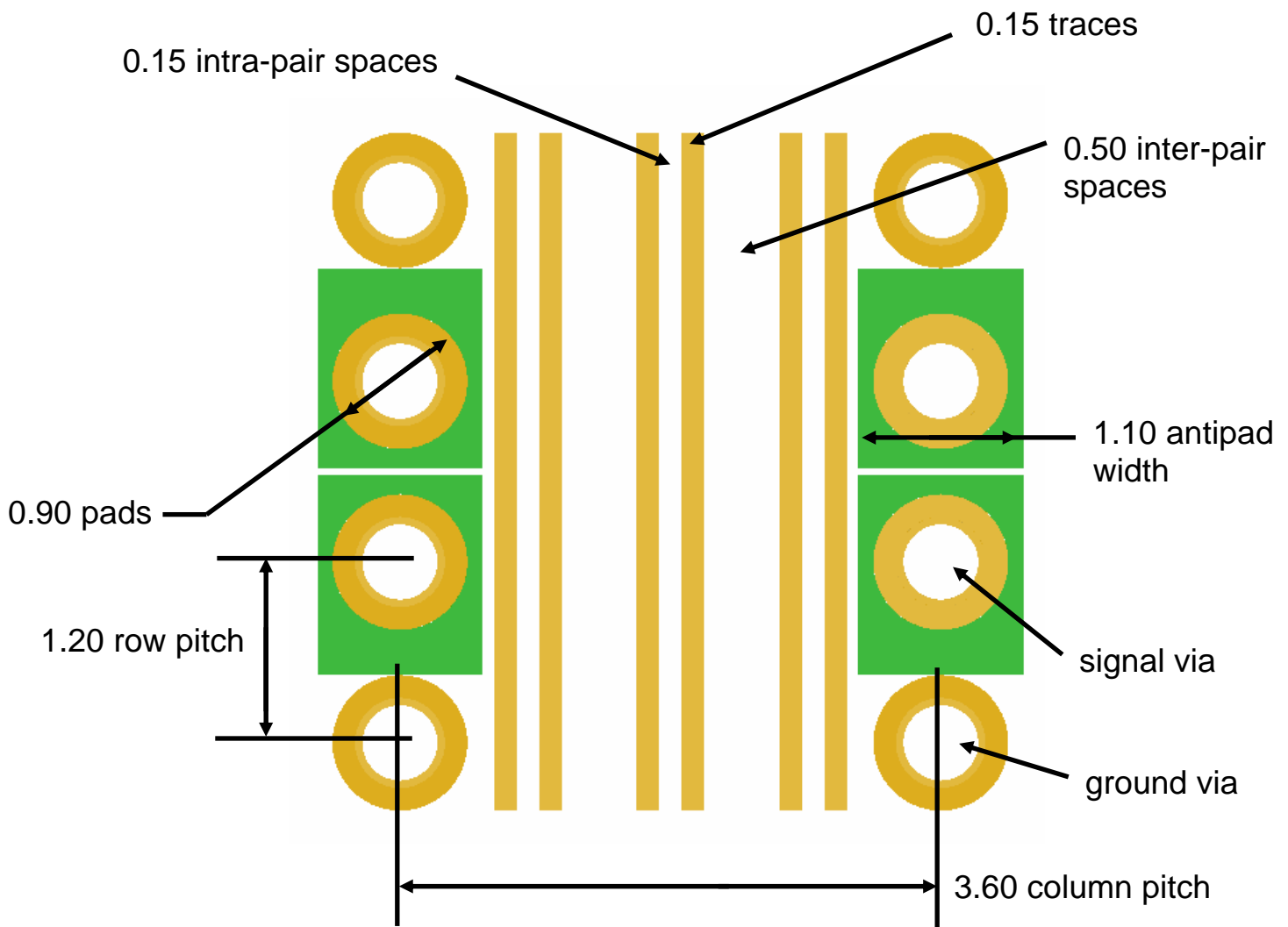



Figure 9: PCB trace routing example, 3.6 mm pitch between columns

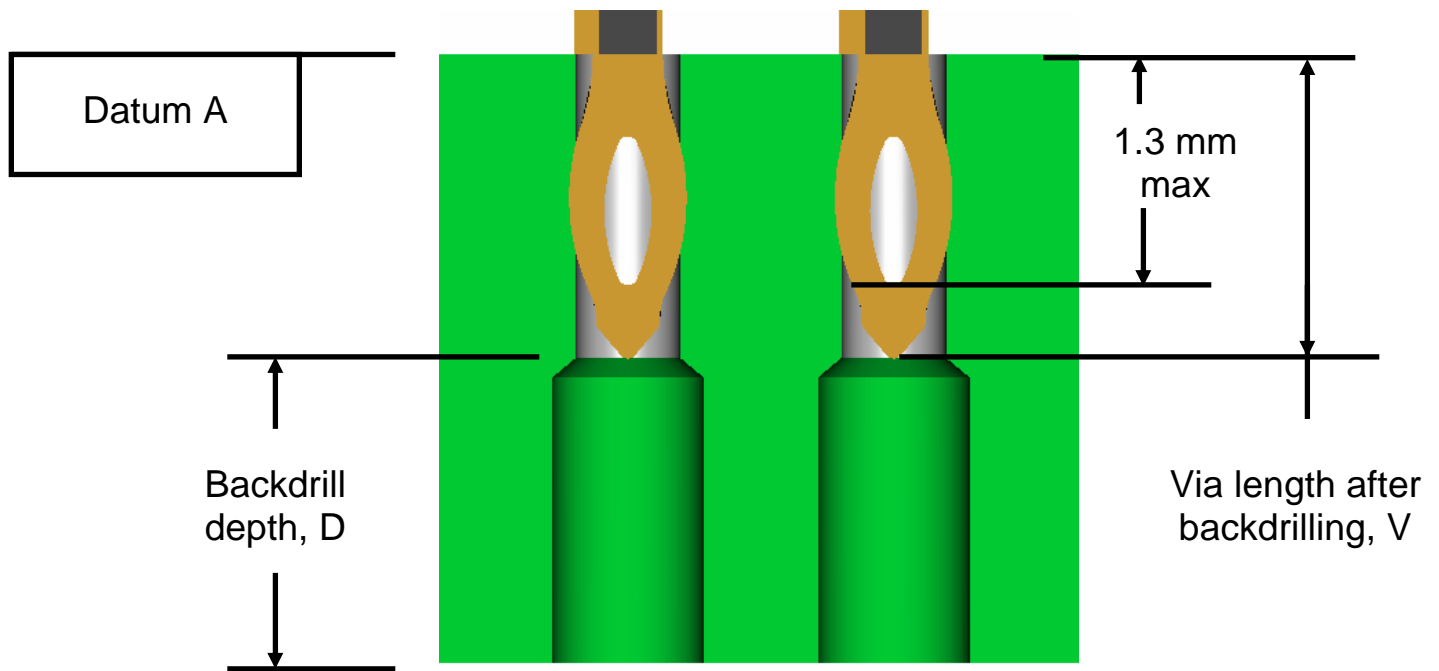
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### 5.7. PRINTED CIRCUIT BOARD THICKNESS

The minimum nominal PCB thickness recommendation for daughter cards and backplanes is **1.60mm**. The absolute minimum PCB thickness recommendation for an orthogonal midplane is **3.5mm** because two press-fit tails enter into opposite sides of the same PCB via (the press-fit tail length specification is 1.60 +/- 0.15mm). There are no maximum thickness requirements.


### 5.8. BACKDRILLING GUIDELINES:

Backdrilling is a method used by system designers that reduces the length of unused conductive via's which will improve high speed signal integrity performance. When backdrilling is performed it is important to avoid damaging the portion of the via that makes contact with any press-fit tails. See below for recommendations on proper backdrilling.



**Figure 10: Backdrilled via's**

After a backdrilling operation, the remaining via barrel (dim V) must be at least 1.3mm to ensure a reliable connection between the AirMax VS® press-fit tails and the PCB. Assuming a backdrilling depth tolerance of +/- 0.3mm relative to datum A, the nominal via length V will be 1.6mm (min V = 1.3mm; max V = 1.9mm).

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### 5.9. PCB SCREEN PRINTING RECOMMENDATIONS:

For vertical headers, it is recommended to print polarization recognition features on the PCB. This will help ensure the connector is properly oriented when placed onto the board prior to press-fit application. These features include the connector outline with a notch in the corner corresponding to pin A1 as defined on each customer drawing. **See Figure 7 in section 7.1 and product customer drawings for additional explanation.**

### 5.10. KEEP-OUT ZONES FOR APPLICATION AND REMOVAL TOOLING:

There are no keep-out zones necessary for application tooling because these tools fit within the outside envelope of the header and receptacle assemblies.

There may be a need for keep-out zones for connector removal tooling. Refer to the FCI Manuals listed in section 9 for information on removal tools and procedures. In general, the need for keep-outs will depend on the specific PCB layout. To be more specific, factors such as pitch definition between adjacent daughter cards and location and type of any nearby connectors all affect the requirements. It is possible to design a system so that no extra keep-out zones are needed.

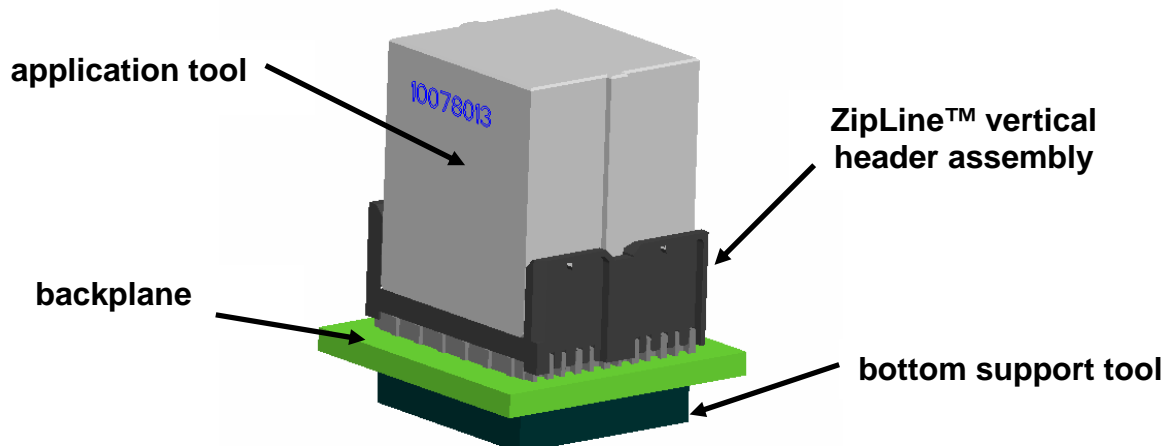
## 6. APPLICATION TOOLING


### 6.1. VERTICAL HEADER (216 position shown)

The application tools recommended for ZipLine™ vertical headers are shown in Table 6. **A special bottom support tool with holes for tail tips will be necessary only if the connector tails are longer than the thickness of the backplane (the tail length specification is 1.60mm +/- 0.15mm).** This tool could be a PCB with oversized holes or a custom tool designed by the user.

Header type	Module width, mm	Insertion tool part no.
6 pair, 12 IMLA, 1.8mm pitch	21.6	10078013

Table 6: Part numbers for header application tools



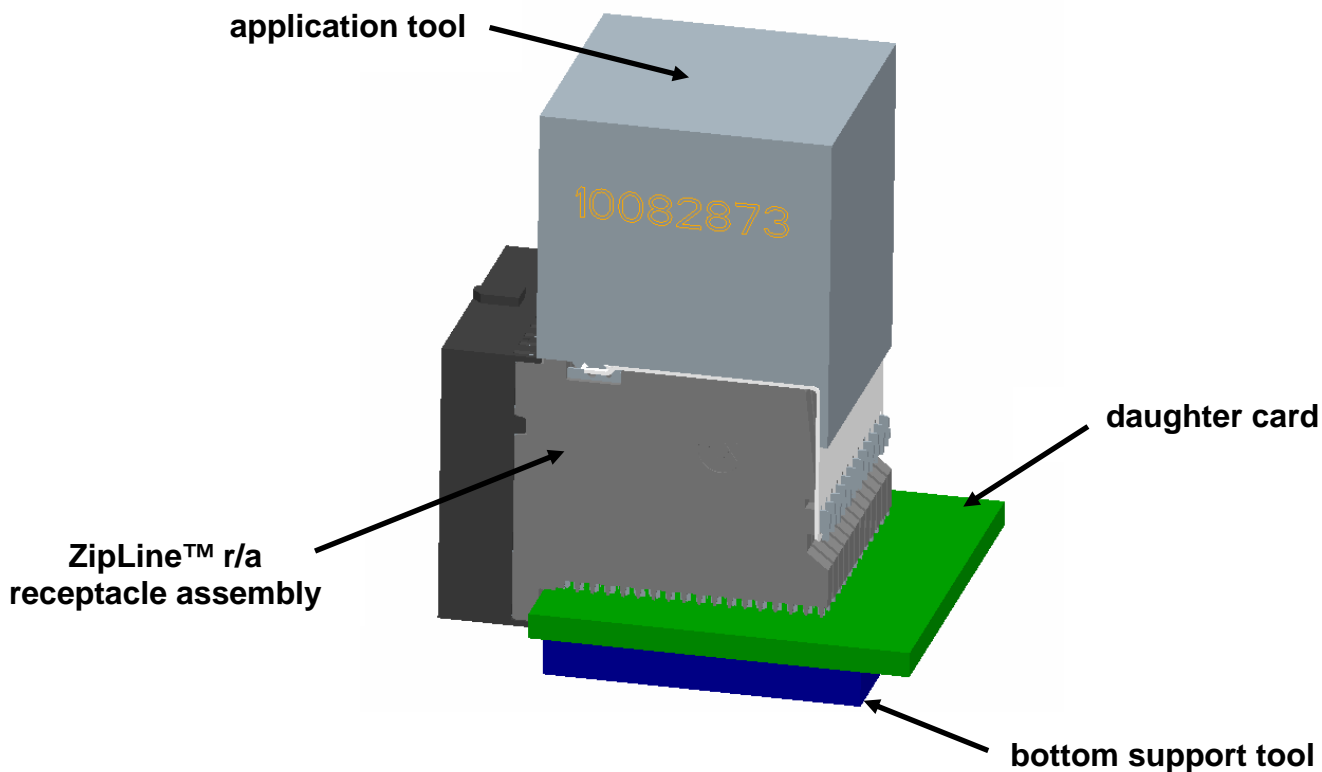
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## 6.2. RIGHT ANGLE RECEPTACLE (216 position shown)

The application tools recommended for ZipLine™ receptacles are shown in Table 7. **A special bottom support tool will be necessary only if the connector tails are longer than the thickness of the daughter card (the tail length specification is 1.60mm +/- 0.15mm).** This tool could be a PCB with oversized holes or a custom tool designed by the user.

Receptacle type	Module width, mm	Insertion tool part no.
6 pair, 12 IMLA, 1.8mm pitch	21.6	10082873

Table 7: part numbers for receptacle application tools



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## 7. APPLICATION PROCEDURE

### 7.1. VERTICAL HEADER (216 position shown)

The application procedure for a header or a receptacle is as follows:

- Place connector assembly in the desired location on the backplane taking care to assure that all press-fit tails line up with the proper holes. For the vertical header, it is important to mount the connector in the correct orientation. It is recommended to screen print the connector outline onto the PCB with a chamfer at the A1 corner (see Figure 10).

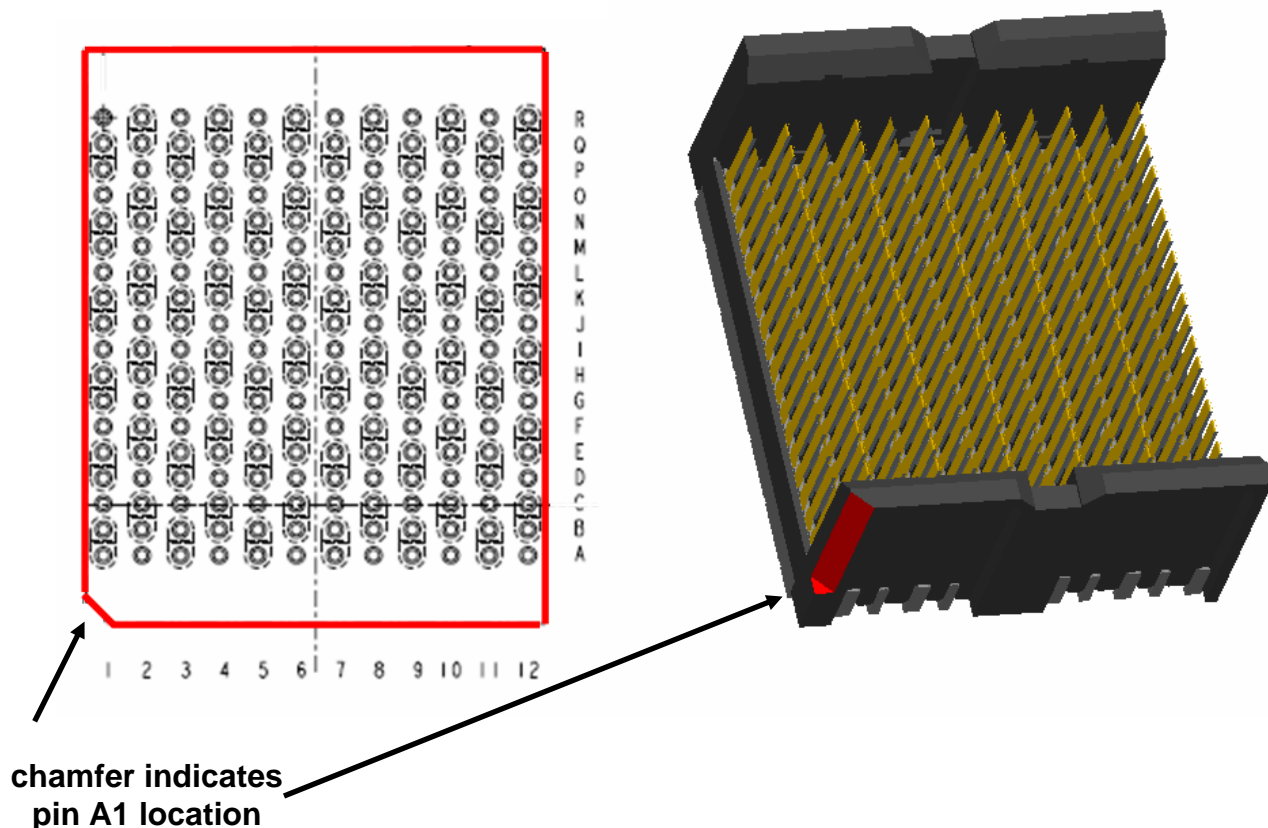

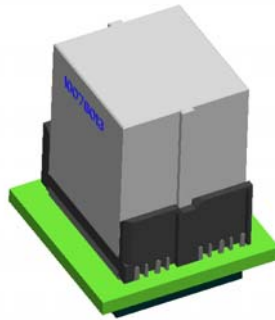


Figure 10: PCB footprint with screen printed connector outline (standard backpanel header shown)

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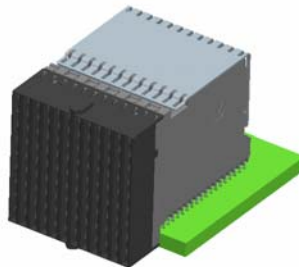
- Place an application tool and a PCB Support in the proper location with respect to the header and PCB as shown below.



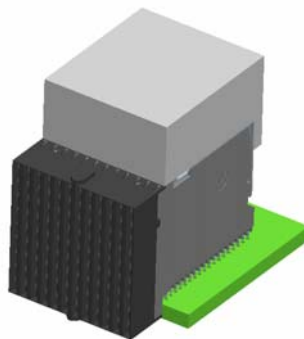
- **To ensure proper insertion, connectors must be centered beneath the press ram.** Offset loading may result in improper seating of the header and mating problems.

## 7.2. RIGHT ANGLE RECEPTACLE (216 position shown)


- Place connector assembly in the desired location on the daughter card taking care to assure that all press-fit tails line up with the proper holes.



- Place the application tool in the proper location with respect to the connector assembly as shown below.



- **To ensure proper insertion, connectors must be centered beneath the press ram.** Offset loading may result in improper seating of the header and mating problems.

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### 7.3. RECOMMENDED INSERTION FORCES

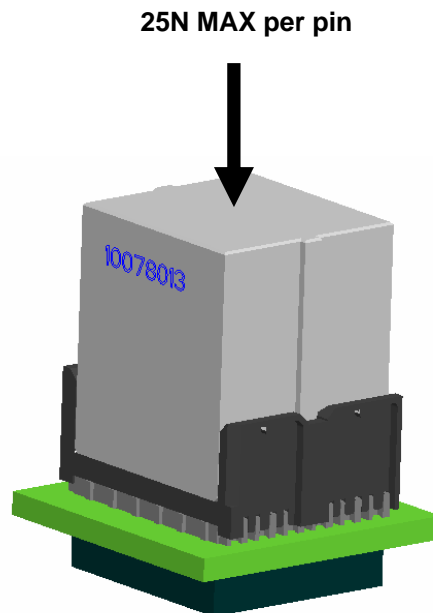
The recommended maximum insertion force for each ZipLine™ press-fit pin is 25 N (5.62 lbf).

These maximum force recommendations have been determined to yield acceptable insertion results for PCB holes within FCI's recommended guidelines. **While it is acceptable to use a lower insertion force per press-fit pin, steps should be taken to guarantee that the connector is seated properly (see Section 8).** Force settings will vary with different types of PTH finishes. Customers should develop parameters that best suit individual application requirements.


**EXAMPLE:** For one ZipLine™ vertical header module shown below, there are 216 press-fit tails being inserted into the PCB. Therefore, the maximum recommended press setting would be 5400 N (216 press-fit tails x 25 N) or 1214 lbf.

- Actuate the insertion press

Actuation of the insertion press should be slow and controlled, not fast like a punch press. Inserting to a specified force will yield more consistent results than inserting to a set distance.



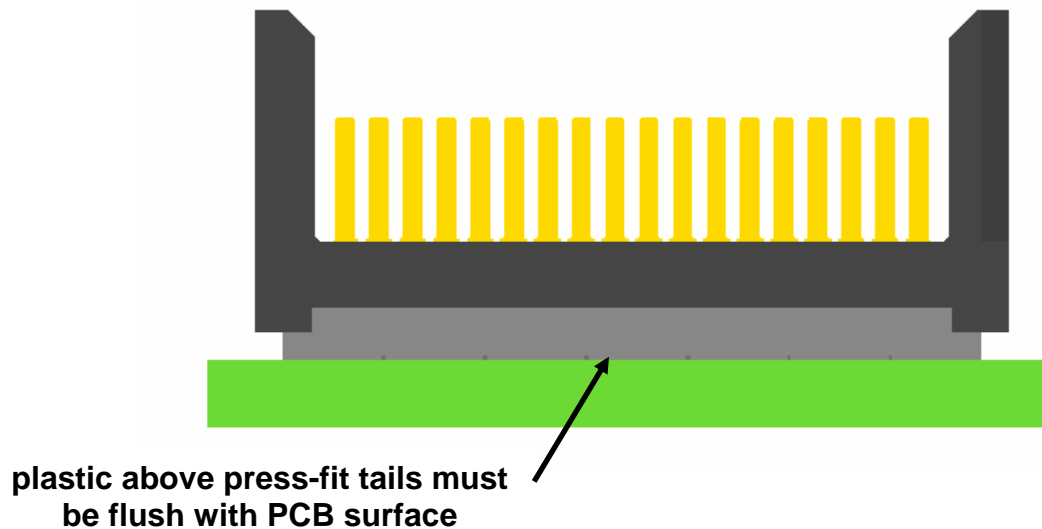
- Remove assembly from insertion press.
- Inspect product for proper application.

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## 8. POST-APPLICATION INSPECTION REQUIREMENTS

Post-application inspection should consist of several simple checks to assure that the connector is applied properly and is not damaged.

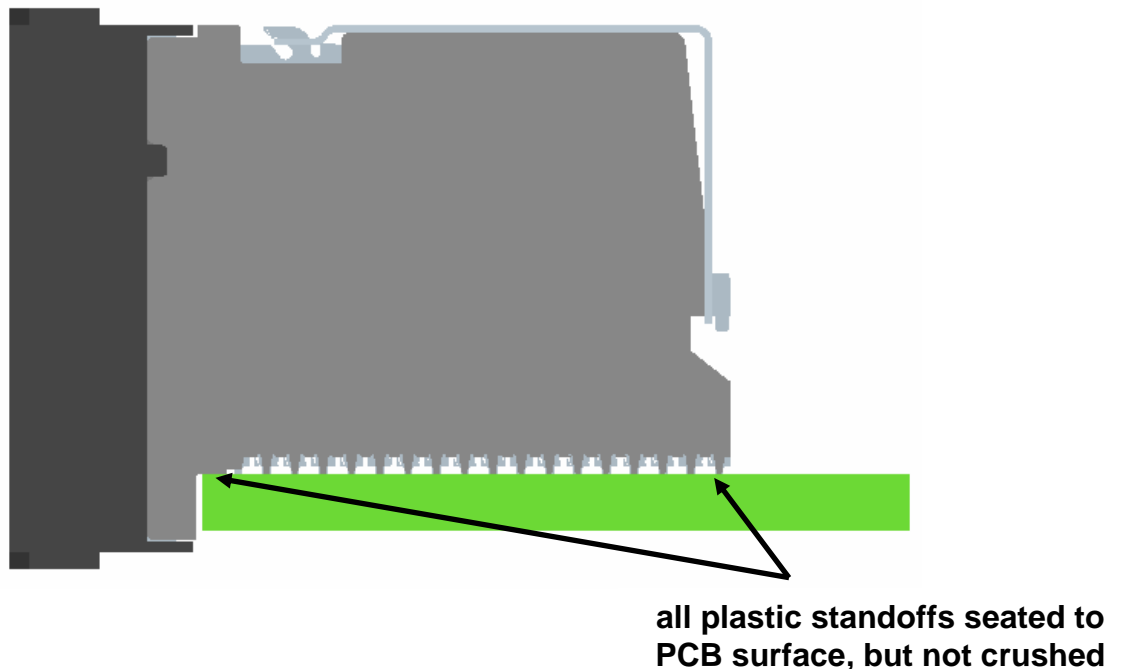
- Visually assure that all press-fit tails are seated in the proper PCB holes and that none have been crushed during application.
- For vertical headers, visually assure that the position A1 chamfered housing cut is properly located relative to the product outline marking on the PCB surface. Also make sure the plastic surface above the press-fit tails is seated to the top surface of the PCB (see Figure 12).



**Figure 12: Proper seating depth for vertical headers**

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- For right angle products, visually assure that the plastic standoffs on the bottom of each assembly are seated flush to the PCB but not crushed. A gap beneath the standoffs indicates that the connector is not seated fully or is not seated parallel to the board. This can cause misalignment when the daughter card is mated to the backplane.




**Figure 13: Proper seating depth for r/a receptacle**

## **9. CONNECTOR REMOVAL TOOLING**

Following are FCI removal tool part numbers for ZipLine™ connectors. The referenced FCI Manuals describe proper connector removal procedures.

Connector type	Column pitch, mm	Module width, mm	Removal tool part no.	FCI manual no.
6 pair	any	any	10082877	<b>TBD</b>

For some connector configurations it may be possible to use multiple repair methods. All recommended methods for repair will be described in the FCI manuals listed above.

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## 10. REVISION RECORD

REV	PAGE	DESCRIPTION	EC #	DATE
1	all	Initial draft	-	8/7/07
2	6-8	Added sections 4.6 and 5.2	-	8/14/07
3	all	Added sections 4.6 & 5.4, modified sections 4.7 & 5.5	-	9/27/07
4	4,14	Updated Table 1 and section 6.2	-	10/9/07
5	10-14	Updated Figure 9, added sections 5.3 & 5.4	-	11/13/07
6	8-11	Corrected pin types in Tables 2b & 4b; changed all signals to blue text; changed all grounds to green text	-	11/19/07