Product Name: ZX180HAPS-RA – FPGA 8x20 BGA Mezzanine card breakout adapter

Product Description: ZX180HAPS-RA is 8x20 BGA SEAM / SEAF breakout adapter, offering full access to SEARAY 8x20 BGA connector via onboard 0402 shunt SMD landing pads. It enables user to implement design changes (cut signal path) , or simply access any signals for test and measurement purpose. ZX180HAPS-RA is designed for any design utilizing SEAM / SEAF 8x20 BGA Samtec or Molex SEARAY connectors as well as Synopsys HAPS HapsTrak 3 HT3 ASIC emulation system.
ZX180HAPS-RA is SEAM / SEAF passive FPGA Mezzanine Card, FMC,

Full access to all connector signals via onboard 0402 shunt SMD footprint. **Page 2** lists accessible signals.
Module reference ground, GND , access point is offered by 2 onboard GND test points interfacing with test equipment, host and target. The GND test points are connected to top/bottom as well as all inner layers ground planes.

1- All signals are accessible via onboard standard 0402 shunt SMD footprint.

2- All signals are pass through, enabling user to implement design changes (cut signal path), if design changes are required.

3- Mates with Samtec or Molex HI-SPEED HI-DENSITY SEARRAY 8x20 BGA connectors.

4- Fully compatible with 8 rows x 20 pins per row single ended or differential pairs design configuration

5- Compatible with Synopsys HAPS ASIC emulation system, interfacing with HapsTrak3 HT3 or any 8x20 BGA design.

6- Designed in **12** layers PCB stackup

7- Improved signal integrity and crosstalk

8- Multiple GND test points connecting directly to inner layers GND planes.

9- Onboard both SEAM and SEAF connectors

10- Matching connector's **50Ω** trace impedance on all signals.

==See Pages 2 & 3 for more details==

1.8" (46mm)

52.8" (71mm)

Electrical:

Insertion loss > -1dB @3GHz

Trace impedance: 50 Ω
PCB Material : FR4, **12** layers
Plating: Gold = 30 µ" (0.76 µm) over 50 µ" (1.27 µm) Ni, all signal layers
Operating Temperature: -55°C to +125°C
Connector:
    Onboard Connector type: SEAM 8x20 BGA – (Male / Plug)
                                   SEAF 8x20 BGA – (Female / Socket)
    Connector contact : Copper Alloy
    Connector housing: LCP UL 94 V0, COLOR: BLACK
    Connector contacts: COPPER ALLOY / LEAD FREE SOLDER
    Connector plating: = 30 µ" (0.76 µm) Au over 50 µ" (1.27 µm) Ni
    Mates with: Any height SEAM and SEAF 8x20 BGA connectors
    Pitch: 0.05" (1.27mm) pin to pin pitch
Shunt:
    Package: 0402 SMD standard footprint
    Plating: Gold = 30 µ" (0.76 µm) over 50 µ" (1.27 µm) Ni

Simplified Block diagram

SEAF / SEAM — **Front View** | SEAF J1 / SEAM J2 — **Side View**
1 ... 160 / 50 Ω

Note:
1- All connector signals are accessible via onboard 0402 SMD footprint
2- SEAM mates with Host (main system)
3- SEAF mates with Target (Mezzanine card)

Typical signal connection:
  0402 shunt SMD Package

Break signal path:

ZX180HAPS-RA interface diagram

SEAF / onboard 0402 shunt SMD footprints / SEAM / SEAF / Host
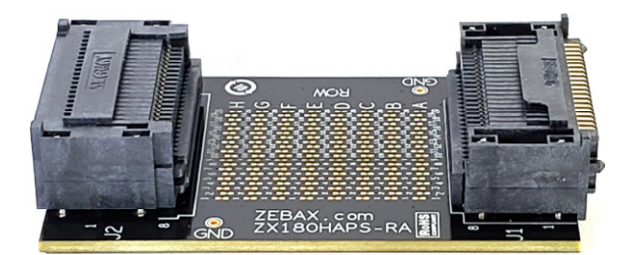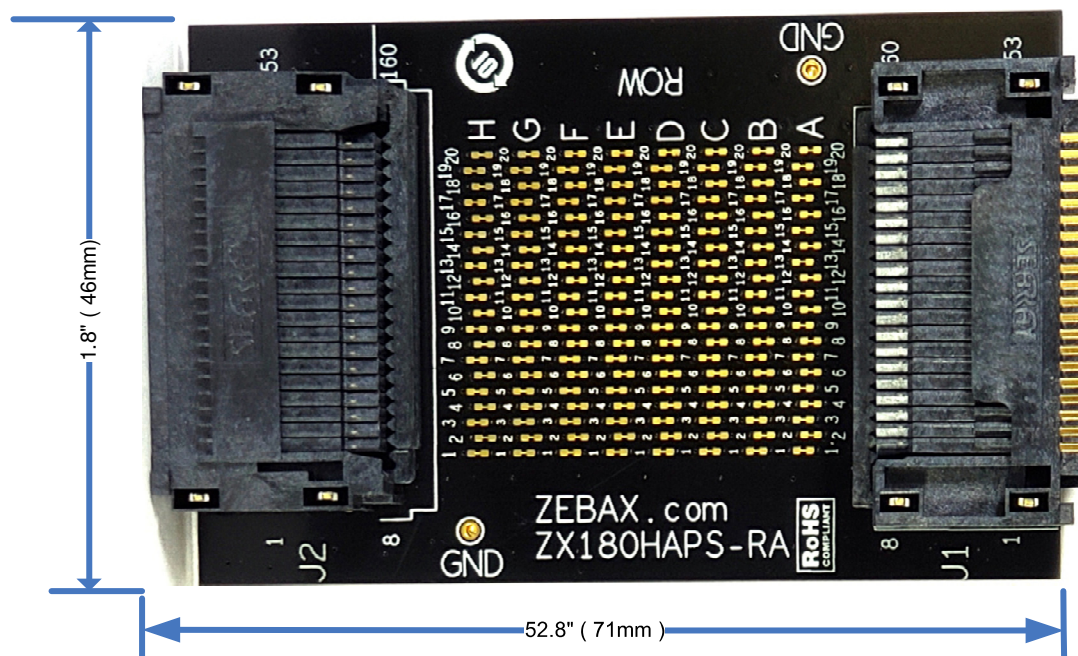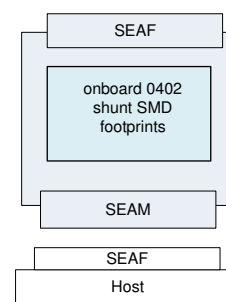
ZX180HAPS-RA package includes:

Part number	Quantity	Description
ZX180HAPS-RA	1	FPGA 8x20 / HAPS breakout adapter
ZX00BC2PH30	0	30AWG Bare Copper wire to pin header wire assembly
ZX0002SRF4	0	High Frequency semi-rigid SMA to bare wire coax cable assembly

ZX00BC2PH30

ZX0002SRF4

Note
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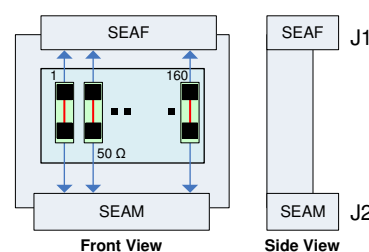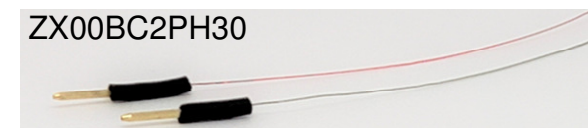
Application: SEAM / SEAF 8x20 Board to Board design validation, characterization test debug and measurement.
Synopsys HAPS HapsTrak 3 , HT3 , Debug of HAPS HapsTrak3 FMC Mezzanine card.
ASIC, emulation prototyping , modular design interface evaluations.

Access: All SEARAY connector signals are accessible via onboard 0402 shunt SMD footprint.

Pitch: 1.27mm (0.05") High Speed connector

Mates with :
SEAM SEAF SEAM-RA SEAF-RA SEAMP SEAFP SEAFP-RA connector series
Molex SEARAY and SEARAY Slim Mezzanine family, including 0459702385 and 0459712385
All listed Samtec Molex FMC connectors listed, please see table on **Page 3**
Synopsys HAPS ASIC emulation system.
Any and all Synopsys HAPS Trak3 HT3 compliant design.

Compliance:
ISO2001 certified
RoHs - Lead Free
EU RoHS2
UL E111594 document
ELV- Vehicle Directive (Directive 2000/EC)
European Union Directive (203/11/EC)
Halogen Free per IEC-61249-2.21 : 2003
RoHs Directive 2011/65/EU
WEEE Directive (2012/12/EU)

Certificate of Compliance for Radioactive substances
Certificate of Compliance for Asbestos
Certificate of Compliance for Ozone Depleting Substances, ODS
Certificate REACH SVHC
Certificate of Compliance RoHS_EN_CoC

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SPECIFIED DIMENSIONS ARE INCHES (MM). ROHS COMPLIANT

ASSEMBLY DRAWING

ITEM: ZX180HAPS-RA

DESCRIPTION: **SEARAY 8x20 FMC Mezzanine breakout adapter - Synopsys HT3 test module**

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Product Name: Cont's ZX180HAPS-RA – FPGA 8x20 BGA Mezzanine card breakout adapter

Ground: The ZX180HAPS-RA module offers two GND test points which are connected to the module inner GND planes and top & bottom GND fills. It is recommended to connect the GND reference test points to system & test equipment GND reference points, Host & target.

Access: ZX180HAPS-RA provides access to all SEARAY , SEAM, SEAF connector contacts via onboard standard 0402 shunts SMD footprint. Table 2.1 & 2.2 lists the accessible connector's (SEARAY) contact as listed the ZX180HAPS-RA.
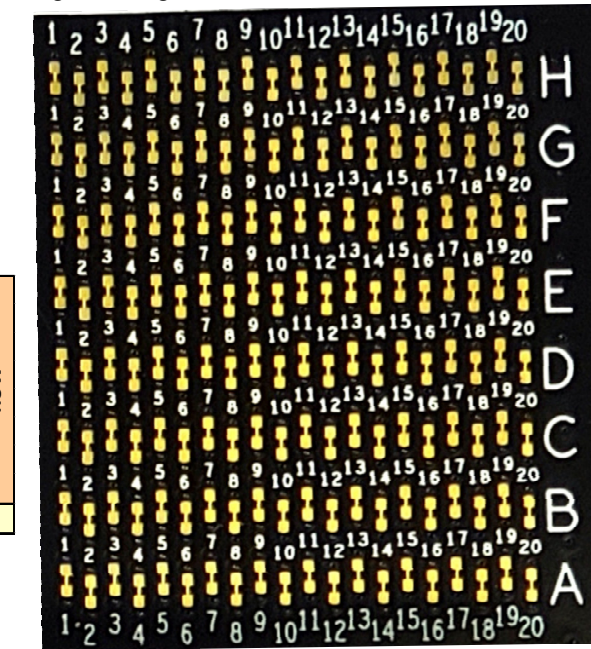
Table 2.1 – Lists the SEARAY signal number based on the Row/Column matrix configuration.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Column
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	H
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127	135	143	151	159	G
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126	134	142	150	158	F
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125	133	141	149	157	E
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124	132	140	148	156	D
3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139	147	155	C
2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122	130	138	146	154	B
1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121	129	137	145	153	A

(ROW)

All signals are represented in X-Y matrix configuration where Row and Column should be used to identify the signal number.

The followings are few recommendations for interfacing ZX180HAPS-RA with test & measurement equipment , scope, function generator, Network Analyzer, power supply, electronics load and more.

1- Using 32AWG solid copper wire with pin header, ZX00BC2PH30 or similar to interface to any scope probe / test equipment
2- Using high frequency semi-rigid coax cable assembly , ZX0002SRF4 , to solder on any signal on ZX180HAPS-RA. The SMA connector part of the cable assembly may be interfaced with any test equipment for purpose of signal injection or interface.

Loopback test: ZX180HAPS-RA may be configured for manufacturing , development , or qualification loopback test configuration. Using any 32AWG solid copper wire to inner connect any connection combination. The ZX180HAPS-RA enables any design loopback test requirement, ensuring solid test & measurement method for pre-bringup, bringup, qualification and manufacturing phase of any design.

Typical Application: ZX180HAPS-RA is designed for purpose of test and debugging at full connector's bandwidth. It provides new approach in usage of breakout adapters by :
1- Utilizing single or differential scope probe for purpose of test & measurements
2- Enabling design changes, by re-assignment of any signal by means of cut and solder, where any signal may be cut and assigned to new location by jumper wires.
3- Loopback test & measurement , enabling software development & testing.

Scope Probe wire Installation:
1- It is recommended to keep the probe wire length at 0.5" (1.2cm) long.
2- In order to avoid ground loop problems, please use the shortest Ground probe wire interfacing to the nearest GND reference. The ZX180HAPS-RA provides two GND test points for reference.
3- Both Keysight as well as Tektronix offer variety of single ended as well as differential probes along with their accessories, below are few probes from each vendor:

    a) Keysight differential probe or similar N2795A, N2796A, 1168V, 1134B along with E2677B differential Solder-in probe, N5426A ZIF Tip, N2884A Fine Wire ZIF Tip and more – See the figure "probe head accessories".
    b) Tektronix offers several single-ended as well as differential probes such as : P6245, P6248, P6247, P6246 or any of TDP7000 series and more
4- Please follow your vendor's guideline in installation of probe wires & accessories.

Figure 2.1 – ZX180HAPS-RA layout design signal assignments

Product Name: Cont's ZX180HAPS-RA – FPGA 8x20 BGA Mezzanine card breakout adapter

Signal Access & re-route: Re-routing any signal on ZX180HAPS-RA may be implemented by cutting the designated 0402 SMD shunt and re-routing to new location or interfacing to test equipment.

Accessories: The following accessories compliment ZX180HAPS-RA for testing purpose.

ZX00BC2PH30 30AWG Bare Copper wire to pin header wire assembly – It can be easily soldered to any pads on the ZX180HAPS-RA for scope probe interface.

ZX0002SRF4 High Frequency SMA to bare wire semi-rigid coax cable assembly – It is **semi-rigid** coax cable assembly where case of the cable assembly is exposed copper. It can easily soldered to any pads on ZX180HAPS-RA. With Insertion loss of >-0.5dB,   ZX0002SRF4 is excellent for characterization and performance test qualification.

Compatibility Matrix : ZX180HAPS-RA is compatible with all listed connectors in the following tables. ZX180HAPSxx is referred to any ZX180HAPS design module, including ZX180HAPS-RA.

ZX180HAPSxx FMC breakout adapter mates with the following Samtec SEARAY™ connectors

Type	Samtec PN	Description
SEAM	SEAM-20-02.0-S-08-1-A-K-TR SEAM-20-02.0-S-08-2-A-K-TR SEAM-20-02.0-L-08-1-A-K-TR SEAM-20-02.0-L-08-2-A-K-TR	male
	SEAM-RA SEAM-20-01-S-08-1-RA SEAM-20-01-S-08-2-RA SEAM-20-01-L-08-2-RA SEAM-20-01-L-08-2-RA	
	SEAMP SEAMP-20-02.0-L-08 SEAMP-20-02.0-S-08 SEAMP-20-02.0-S-08-GP	
SEAF	SEAF SEAF-20-05.0-S-08-2-A-K-TR SEAF-20-05.0-L-08-2-A-K-TR	female
	SEAFP-RA SEAFP-20-01-L-08-RA-WT-GP SEAFP-20-01-L-08-RA-WT	
	SEAFP SEAFP-20-05.0-L SEAFP-20-05.0-S	
	SEAF-RA SEAF-20-S-08-2-RA-GP SEAF-20-S-08-2-RA-LP SEAF-20-08-2-RA-K	

ZX180HAPSxx FMC breakout adapter mates with the following Molex SEARAY Slim Mezzanine connectors

Molex	
SEAM (Male)	**SEAF (Socket)**
045970-2185 45970-2185 0459702185	045971-2185 45971-2185 0459712185
045970-2285 45970-2285 0459702285	045971-2285 45971-2285 0459712285
045970-2385 45970-2385 0459702385	045971-2385 45971-2385 0459712385
045970-2485 45970-2485 0459702485	045971-2485 45971-2485 0459712485
045970-2585 45970-2585 0459702585	045971-2585 45971-2585 0459712585
045970-2685 45970-2685 0459702685	
045970-2715 45970-2715 0459702715	

SEARAY 45970 and 45971 are offered at various mated stacking heights, ZX180HAPSxx mates with all versions of 8 columns 20 rows version of the Slim Mezzanine connector series.

SEAM / SEAF connectors are offered with various options as listed below, ZX180HAPSxx mates with all versions of the SEAM / SEAM family for the 8 columns 20 row configuration.
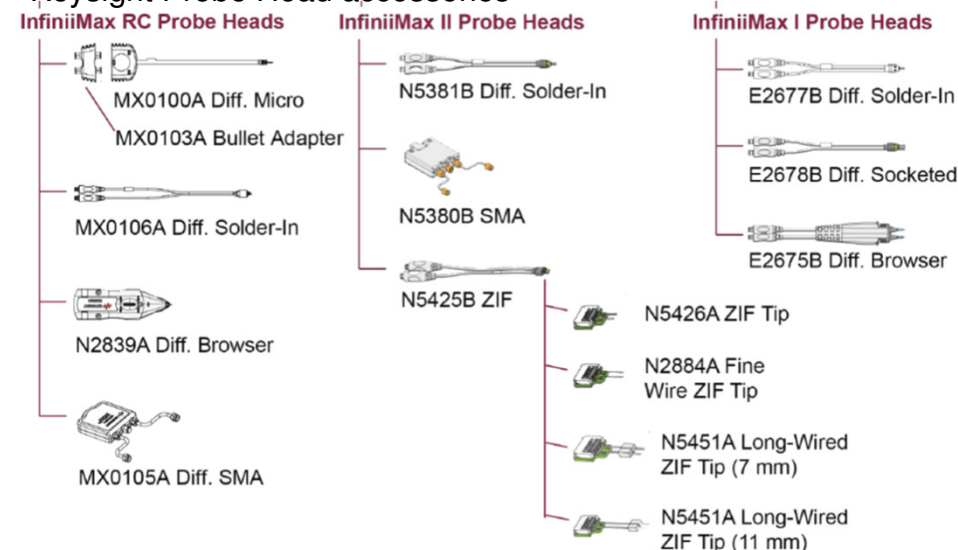
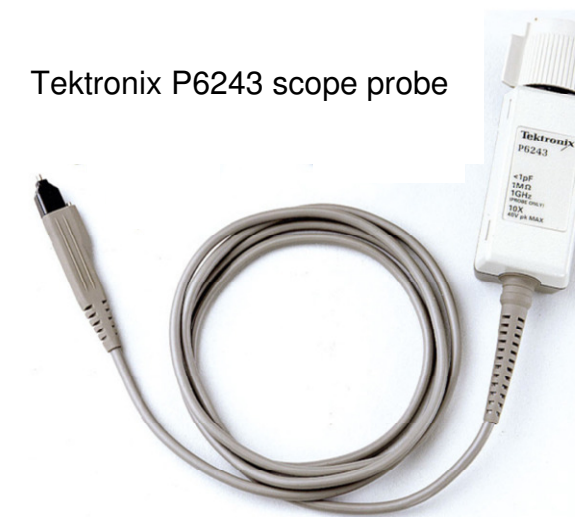| Option	Description
"-L"	10u" (0.25um) Gold on contact area
"-S"	30u" (0.76um) Gold on contact area
"-1"	Tin/Lead Alloy Solder Charge
"-2"	Lead-Free Solder Charge

Keysight Probe Head accessories

InfiniiMax RC Probe Heads

MX0100A Diff. Micro
MX0103A Bullet Adapter
MX0106A Diff. Solder-In
N2839A Diff. Browser
MX0105A Diff. SMA

InfiniiMax II Probe Heads

N5381B Diff. Solder-In
N5380B SMA
N5425B ZIF
N5426A ZIF Tip
N2884A Fine Wire ZIF Tip
N5451A Long-Wired ZIF Tip (7 mm)
N5451A Long-Wired ZIF Tip (11 mm)

InfiniiMax I Probe Heads

E2677B Diff. Solder-In
E2678B Diff. Socketed
E2675B Diff. Browser
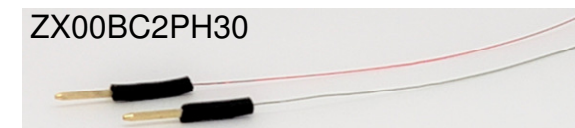
Tektronix P6243 scope probe

ZX00BC2PH30

ZX0002SRF4

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		SHEET: 3 OF 3