Product Name: ZX122S1AEP PCISIG M.2 NGFF Socket 1 Key AE passive power measurement module – Page 1 of 3

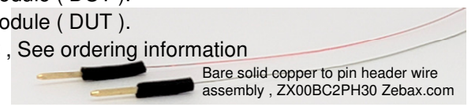
Product Description: ZX122S1AEP is PCISIG M.2 power measurement module providing access to PCISIG M.2 power supply rails for purpose of characterizing , test & measurement of PCISIG M.2 supply voltages

Measure and analyze power supply ripple, transients, Device Under Test, DUT, power consumption and more.

a) Each power supply rail is designed with current sensing power resistor, please see block diagram.
b) Utilizing scope probe – test equipment , measure power supply noise, ripples, transients, and DUT power consumption.
c) Utilizing eLoad (Electronic Load) , qualify host's power supply & maximum output power.
d) Identify power supply trace impedance, Rdc , for improved Host / DUT PCB design.

ZX122S1AEP features:

1- Pass through PCISIG signals enabling real-time power supply test and measurement.
2- Onboard current sense resistors for all supply rails – Please see table 1 for details.
3- All other traces are pass through designed for 50 Ohms impedance controlled.
4- Four layers PCB design, inner layers are GND planes + Exposed copper on top and bottom fill
5- Accessible GND exposed copper, enabling for ease of probe access for test and measurement.
6- Mates with any key matching M.2 Host and Device / DUT
7- ZX122S1AEP-A converts host M.2 Key E interface to M.2 Key A module (DUT).
8- ZX122S1AEP-E converts host M.2 Key A interface to M.2 Key E module (DUT).
9- The module is shipped with 12pc of probing wires , ZX00BC2PH30 , See ordering information



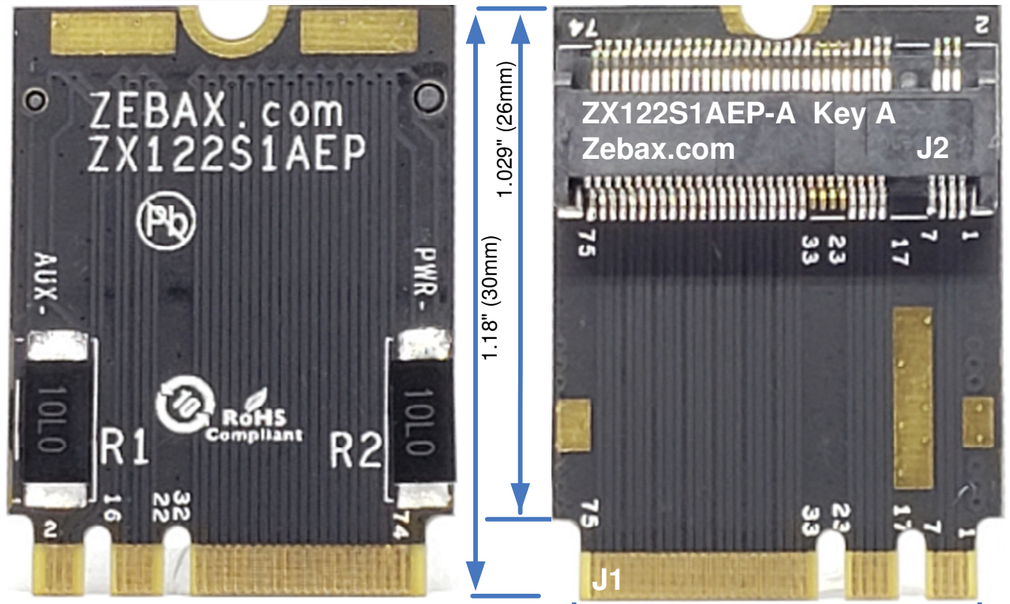


Figure 1 – ZX122S1AEP

Electrical:

Insertion loss > -2dB @6GHz
Trace impedance: 50 Ω
Operating Temperature: -65℃ to +170℃
M.2 Edge Connector type (J1) : Key AE
Mates with: M.2 Key AE
Plating: Gold 100U
M.2 Receptacle (J2) :
Key Type: Key AE
Height: 0.16" (4.2mm)
Spacer : 0.1" (2.54mm) – See Figure 3
Plating: Gold 100U
Current per pin: 0.5A (maximum)
Current Sense:
R1, R2 : 10mΩ 2512 SMD 7W - Thickness: 0.02" (0.5mm) Max - See Figure 3
Ratings: AEC-Q200
Temperature Coefficient: ±75ppm / ℃
Operating Temperature:-65℃ to +85℃ at 100% listed power rating, see Table 1
-65℃ to +170℃ see section Power Rating on page 3
Shunt:
Package: 0402 SMD

Figure 3- M.2 receptacle

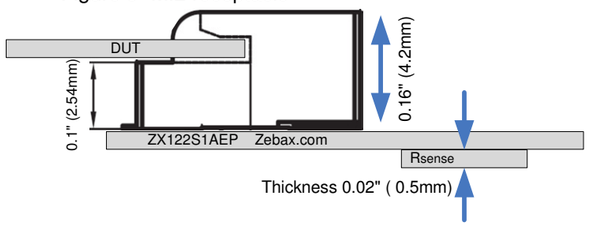
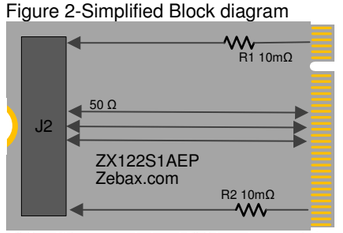
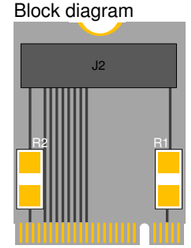


Figure 2-Simplified Block diagram



50 Ω : All traces are designed 50 Ω impedance control
J2 : PCISIG M.2 receptacle connector.



R1, R2: current sense 3.3V V_{BAT}

Note 1 : ZX122S1AEPS is offered with M.2 Receptacle (J2) Key A or Key E.
ZX122S1AEP-A Converts M.2 Key E host to M.2 Key A module interface.
ZX122S1AEP-E Converts M.2 Key A host to M.2 Key E module interface.

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

ZX122S1AEP package includes:

Part number	PCB Edge	J2	Quantity	Description
ZX122S1AEP-A	Key AE	Key A	1	M.2 PCISIG Socket 1 power measurement module, Note 1
ZX122S1AEP-E	Key AE	Key E	1	M.2 PCISIG Socket 1 power measurement module, Note 1
ZX00BC2PH30			12	30AWG Bare Copper wire to pin header wire assembly

ZX00BC2PH30 site page for ordering ZX00BC2PH30 wire assembly

Current Sense resistors: Table 1 lists onboard ZX122S1AEP current sense resistors and associated PCISIG M.2 connector assignment

Table 1

Current Sense Resistor	PCISIG M.2 Connector pin number	PCISIG M.2 Supply Rail	Description	Package	
				(inch)	(mm)
R1	2, 4	3.3 V	10m Ohms 1% 7W	2512	6432
R2	72, 74	3.3 V	10m Ohms 1% 7W	2512	6432

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SPECIFIED DIMENSIONS ARE INCHES (MM).
ROHS COMPLIANT

ASSEMBLY DRAWING

ITEM: ZX122S1AEP

DESCRIPTION: PCISIG M.2 NGFF Socket 1 Key AE passive power measurement module

CHECKED: M. MARINA
DRAWN: MATTHEW CT
REVISSION: 1.0
SHEET: 1 OF 3

Current Sense resistors: The current sense resistors may be removed if external electronic load , eLoad, is used. eLoad test equipment may be applied to ZX122S1AEP for power supply characterization , test and measurements. Eload suppliers : BK Precision , Chroma, Instek , Kikusui and more

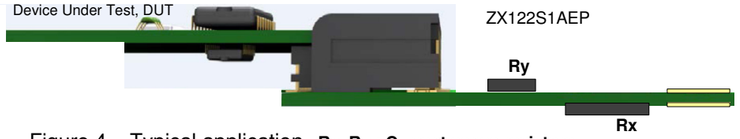


Figure 4 – Typical application **- Rx, Ry : Current sense resistors**

Signal assignments: Table 2 exhibits the routed M.2 PCISIG signals on the ZX122S1AEP module.
Please note: Table 2 represents only the PCISIG M.2 Socket 1 Key AE power supply and the assigned GND , PCISIG M.2 reference ground, signal assignments for "Socket 1 Key AE" applications.

Ground / Exposed Copper :
All of the PCISIG M.2 GND , reference ground , signals are connected to each other along with the 2 inner GND planes. In addition; the exposed copper on the ZX122S1AEP is the module's GND for purpose of rework and probing purpose.

PCISIG M.2 signals :
ZX122Px passes through all PCISIG M.2 signals (excluding the power supply rails . All traces are 50 Ohms impedance controlled. ZX122Px passes through the reserved "NC" No Connect signals as well.

Application: Bringup, testing, emulation, development, modular design evaluations
M.2 PCISIG Socket power supply test characterization
SDIO SSD SATA WWAN DP WIFI GPS GYRO Compass BT FM sensor module
Socket 1 Add-in Card Key AE-E , Socket 1 DisplayPort Key AE , Socket 1 SDIO Key E
Socket 2 WWAN Key C , Socket 2 PCIe-based SSD Key B-M , Socket 2 SATA-based SSD Key B-M
Socket 2 PCIe / USB 3.1 Gen1-Based WWAN Key B , Socket2 PCIe-Based WWAN Key B
Socket 2 USB3.1 Gen1-based WWAN Key B , Socket 2 SSIC WWAN Key B
Socket 3 PCIe-based Key M , Socket 3 SATA-based Key M

Mates with : Any standard M.2 NGFF PCISIG connector on host and device Key AE
TE 2199125 2199119 2199230 2199133 JAE SM3ZS067
Bellwether: SD-80148 SD-80149 SD-80152 SD-80159 Amphenol

Table 2 – PCISIG M.2 Socket 1 Key AE

Please note: Table 2 represents only the PCISIG M.2 Socket 1 Key AE power supply and the assigned GND , PCISIG M.2 reference ground, signal assignments for "Socket 1 Key AE" applications.

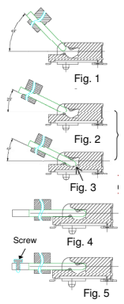
Socket 1 Key A-E						
Signal	PCISIG M.2 connector pin	ZX122S1AEP			PCISIG M.2 connector pin	Signal
	Pin	Label[1]		Label[1]	Pin	
3.3 V	74	R2		EP[2]	75	GND
3.3 V	72				69	GND
ADD-IN CARD KEY E	30				63	GND
	28				57	GND
	26				51	GND
	24				45	GND
GND	18	EP[2]			39	GND
ADD-IN CARD KEY A	14				33	GND
	12				31	ADD-IN CARD KEY E
	10				29	
	8				27	
3.3 V	4	R1			25	
3.3 V	2				15	ADD-IN CARD KEY A
					13	
					11	
					9	
				EP[2]	7	GND
					1	GND

Note **1:** Label is the listed reference designator for the current sense resistors **2-** Exposed Copper is connected to inner GND planes, see Exposed Copper

Module Insertion, Removal process:

In order to avoid any mechanical stress or damage to ZX122S1AEP, please follow the below listed guidelines for insertion and removal process:

1- Move the Module against the housing chamber, see figure 1
2- Rotate module to 25°, insert it until the module surface reaches the ramp, figure 2, 3
3- Rotate the module to horizontal position, see figure 4
4- Fix the module by screw, see figure 5



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ROHS COMPLIANT

ASSEMBLY DRAWING

ITEM: ZX122S1AEP

DESCRIPTION: PCISIG M.2 NGFF Socket 1 Key AE passive power measurement module

CHECKED: M. MARINA
DRAWN: MATTHEW CT
REVISSION: 1.0
SHEET: 2 OF 3

Product Name: **ZX122S1AEP PCISIG M.2 NGFF Socket 1 Key A passive power measurement module – Page 3 of 3**

Typical Application: ZX122S1AEP is designed for purpose of PCISIG M.2 power supply characterization, test and debug at full connector's bandwidth. It provides onboard current sense resistors where scope probe could be utilized for measuring characterization data for qualifying the host or device functional behavior. Additionally, the current sense resistors may be replaced by eLoad for transient and dynamic load throttling. Below are few suggestions in respect to proper power supply measurements using ZX122S1AEP module:

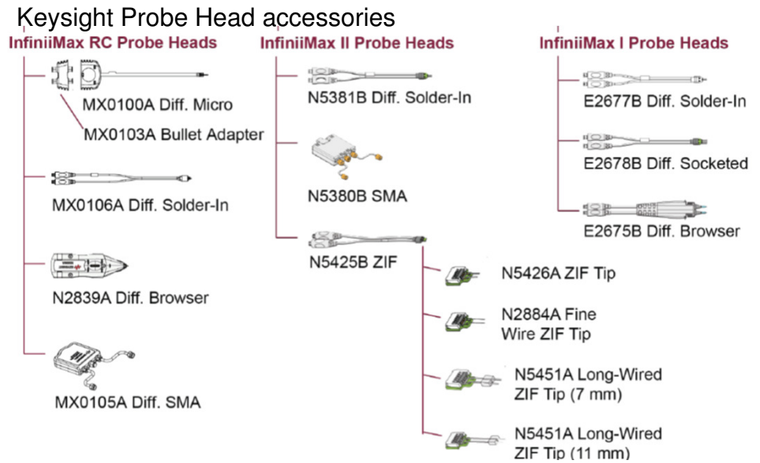
Scope Probe wire Installation:

Utilize the supplied ZX00BC2PH30 bare copper to pin wire assembly whenever possible – Based on availability of type of scope + probing options, install probe wire as listed below

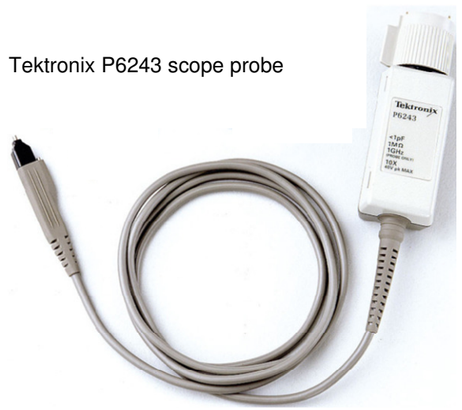
1- It is recommended to keep the +probe wire length at 0.5" (1.2cm) long.
2- In order to avoid ground loop problems, please use the shortest Ground probe wire interfacing to the nearest GND reference. ZX122S1AEP provides several exposed copper test points for probing purpose.
3- Ensure scope probe's bandwidth is set at 20MHz – Certain tests require full scope + scope probe bandwidth; however , industry standard is 20MHz bandwidth for power supply test and measurements.
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 : P6243, P6245, P6248, P6246, P6247 or any TP1500, TAP2500, TAP3500, TAP4000, P7240 of TDP7000 series or equivalent

4- Please follow your vendor's guideline in installation of probe wires & accessories.



Tektronix P6243 scope probe



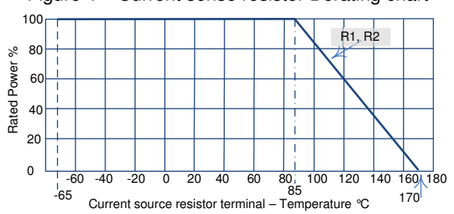
Power Rating : Onboard current sense resistors on ZX122S1AEP module are designed for maximum power consumption per PCISIG M.2 specification operating within -65℃ to 85℃ temperature range. The current sense resistor's power rating will degrade at above 85℃ test environment. It is highly recommended to utilize external cooling fan if your design expects to exceed maximum current via each PCISIG M.2 pin (0.5A per pin) at **above** 85℃ test environment.
The onboard current sense resistors operate at 100% listed power ratings (see Table 1) within temperature range :
R1, R2 : -65℃ ≤ operating temperatures ≤ 85℃ with tolerance = ±1%

The onboard current sense resistors **power ratings** derail at **above** 85℃. Figure 4 exhibits the current sense resistors derating curve.
Current sense resistors rated power ; P = VI = I**2 x R where I is the maximum current for the listed resistor value R

Below are few suggestions, if your test & measurement environment falls ≥ **+85℃** temperature range :

1- Apply cooling fan where the current sense resistor's terminal blocks are measured at 85℃ – Please note - The ZX122S1AEP module design provides heatsink solution to the onboard current sense resistors via inner layers thermal distribution method.
2- Replace the onboard current sense resistors with lower values (similar footprint), resulting at higher power ratings at ≥ 85℃ test environment.
3- Replace onboard current sense resistors with eLoad (electronic Load Board / System) – eLoad system resides outside of test chamber, therefore it is not subject to temperature degradation.

Figure 4 – Current sense resistor Derating chart



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