Product Name: **ZX122S3MPS PCISIG M.2 NGFF Socket 3 Key M passive breakout adapter - power measurement module – Page 1 of 3**

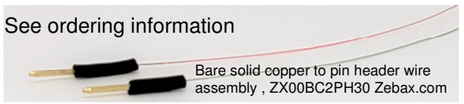
Product Description: ZX122S3MPS is PCISIG M.2 breakout adapter providing access to all PCISIG signals as well as providing method of power supplies test and measurement. ZX122S3MPS is breakout adapter to be used for :

1- Test and measurement for signal quality, characterization , test and debug of any PCISIG signals via onboard 0405 SMD shunt landing pads.
- a) Each PCISIG (excluding GND signals) are routed to 0402 SMD shunt package for easy probe access.
- b) Each 0402 SMD shunt package may be wired for signal measurement via scope / test equipment.
- c) Each 0402 SMD shunt package may be cut and redirected to another signal (onboard or offboard) for test and debug.

2- 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.

ZX122S3MPS features:

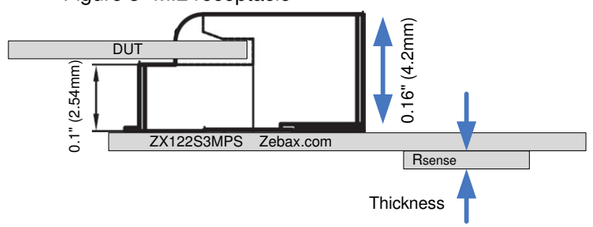
1- Provides access to ALL PCISIG signals via onboard 0402 SMD shunt packages
2- Onboard current sense resistors for all supply rails – Please see table 1 for details.
3- Listed number adjacent to each 0402 SMD shunt package represents the associated PCISIG M.2 connector's pin number.
4- All traces are 50 Ohms impedance controlled.
5- Four layers PCB design, inner layers are GND planes.
6- Accessible GND exposed copper, enabling for ease of access for test and measurement.
7- Mates with any key matching M.2 Host and Device / DUT
8- The module is shipped with 12pc of probing wires , ZX00BC2PH30 , See ordering information

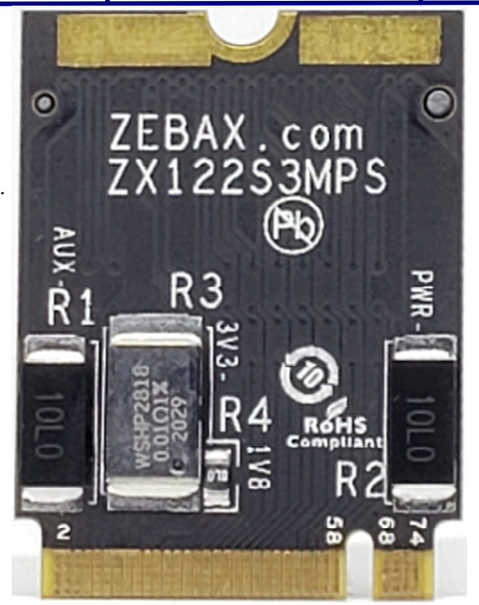


Electrical:

Insertion loss > -2dB @6GHz
Trace impedance: 50 Ω
Operating Temperature: -65℃ to +170℃
M.2 Edge Connector type (J1) : Key M
Mates with: M.2 Key M
Plating: Gold 100U
M.2 Receptacle (J2) :
Key Type: Key M
Height: 0.16" (4.2mm)
Spacer : 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
R3 : 10mΩ 2818 SMD 10W - Thickness: 0.059" (1.5mm) Max - See Figure 3
R4 : 8mΩ 0805 SMD 1W
Ratings: AEC-Q200
Operating Temperature:-65℃ to +85℃ at 100% listed power rating, see Table 1
-65℃ to +170℃ see section Power Rating on page 3
Temperature Coefficient: ±75ppm / ℃
Shunt:
Package: 0402 SMD

Figure 3- M.2 receptacle





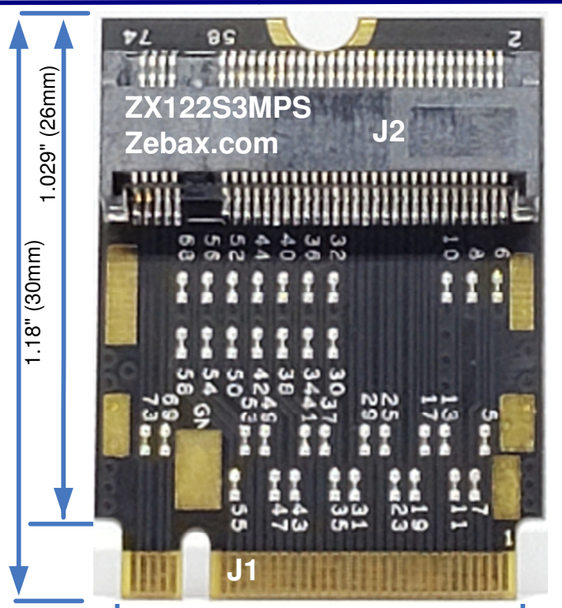
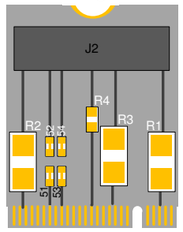
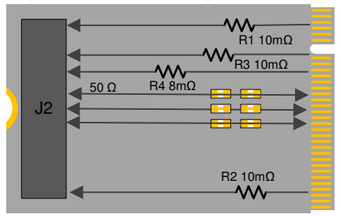


Figure 1 – ZX122S3MPS Block diagram

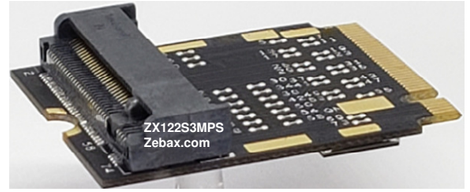


R1,R2: current sense 3.3V / VBat resistor
R3: current sense 3.3V / VBAT
R4: current sense VIO 1.8V
51 .. 54 PCISIGN connector pin number routed to the 0402 SMD shunts.

Figure 2 – Circuit diagram



Shunt 0402 SMD package 0 Ω
50 Ω : All traces are designed 50 Ω trace impedance control
J2 : PCISIG M.2 receptacle connector for the ZX122S3MPS



Current Sense resistors: Table 1 lists onboard ZX122S3MPS 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)	Package (mm)
R1	2, 4,	3.3 V	10m Ohms 1% 7W	2512	6432
R2	70, 72, 74	3.3 V	10m Ohms 1% 7W	2512	6432
R3	12, 14, 16, 18	3.3 V	10m Ohms 1% 10W	2818	7146
R4	22	1.8 V	8m Ohms 1% 1W	805	2012

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

ZX122S3MPS package includes:

Part number	PCB Edge	J2	Quantity	Description
ZX122S3MPS	Key M	Key M	1	M.2 PCISIG Socket 3 Key M module
ZX00BC2PH30			12	32AWG Bare Copper wire to pin header wire assembly

ZX00BC2PH30 site page for ordering ZX00BC2PH30 wire assembly

Notice

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ASSEMBLY DRAWING

ITEM: ZX122S3MPS

DESCRIPTION: PCISIG M.2 NGFF Socket 3 Key M passive breakout adapter power measurement module

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

Product Name: **ZX122S3MPS PCISIG M.2 NGFF Socket 3 Key M passive breakout adapter - power measurement module – Page 2 of 3**

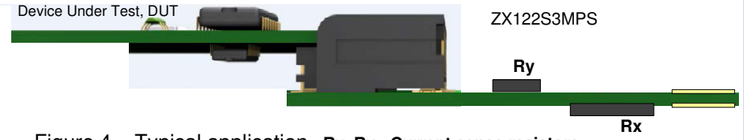

Figure 4 – Typical application **- Rx, Ry : Current sense resistors**

Current Sense resistors: The current sense resistors may be removed if external electronic load , eLoad, is used. eLoad test equipment may be applied to ZX122S3MPS for power supply characterization , test and measurements. Eload suppliers : BK Precision , Chroma, Instek , Kikusui and more

Signal assignments: Table 2 exhibits the routed M.2 PCISIG signals on the ZX122S3MPS module.

1- Table 2 represents only the PCISIG M.2 Socket 3 Key M power supply and the assigned GND , PCISIG M.2 reference ground, signal assignments for “Socket 3 Key M” applications.

2- Table 2 represents only the PCISIG M.2 Socket 3 Key M signal assignments for the listed application. However; **there are other PCISIG** signal assignment for the M.2 Socket 3 Key M design configuration. All PCISIG M.2 assigned Power Supply rails and GND reference M.2 pin assignments are identical across PCISIG M.2 Socket 3 Key M solutions. Please apply your design signal name convention to non-power supply rail signals as the listed signal names on the Table 1 applies to the listed specific M.2 application.

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 ZX122S3MPS is the module’s GND for purpose of rework and probing purpose.

PCISIG M.2 signals :

ZX122S3MPS passes through all PCISIG M.2 signals (excluding the power supply rails . All traces are 50 Ohms impedance controlled. ZX122S3MPS passes through limited number of NC, No Connect , signals. Please see NC, No Connect section below for more details.

NC, No Connect :

Due to space constraints, ZX122S3MPS does not pass through all the **NC** PCISIG M.2 signals. By definition, these signals are Not Connect, therefore they could be left open ended. The NC signals which ZX122S3MPS does not support have open connection at both J1 and J2 connectors. All the listed signals marked **Note 3** in table 2 have not been routed from J1 to J2. The listed signals are open at J1 and J2 connectors.

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 3 Add-in Card Key M-E , Socket 3 DisplayPort Key M , Socket 3 SDIO Key E
Socket 2 WWAN Key M , 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 M
TE 2199125 2199119 2199230 2199133 JAE SM3ZS067
Bellwether: SD-80148 SD-80149 SD-80152 SD-80159 Amphenol

Module Insertion, Removal process:

In order to avoid any mechanical stress or damage to ZX122S3MPS, 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

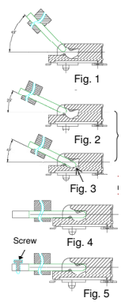

Table 2 – PCISIG M.2 Socket 3 Key M

Please note: Table 2 represents only the PCISIG M.2 Socket 3 Key M power supply and the assigned GND , PCISIG M.2 reference ground, signal assignments for “Socket 3 Key M” applications.

Socket 3 PCIe-based Key M						
Signal	PCISIG M.2 connector pin	ZX122S3MPS			Pin	Signal
	Pin	Label[1]		Label[1]		
3.3 V	74	R2			75	**GND**
3.3 V	72			73	73	VIO_CFG (O)
3.3 V	70				71	**GND**
SUSCLK (I)(0/1.8V/3.3V)	68	68		69	69	PEDET = NC (PCIe)
ADD_IN CARD KEY M	66			67	67	NC
ADD_IN CARD KEY M	64				65	ADD_IN CARD KEY M
ADD_IN CARD KEY M	62				63	ADD_IN CARD KEY M
ADD_IN CARD KEY M	60				61	ADD_IN CARD KEY M
Reserved for MFG_CLOCK	58	58			59	ADD_IN CARD KEY M
Reserved for MFG_DATA	56	56			57	**GND**
PEWAKE# (I/O)(0/1.8V/3.3V)	54	54		55	55	REFCLKp
CLKREQ# (I/O)(0/1.8V/3.3V)	52	52		53	53	REFCLKn
PERST# (I)(0/1.8V/3.3V)	50	50			51	**GND**
NC	48	Note 3		49	49	PERp0
NC	46	Note 3		47	47	PERn0
ALERT# (O)(0/1.8V)	44	44			45	**GND**
SMB_DATA (I/O)(0/1.8V)	42	42		43	43	PETp0
SMB_CLK (I/O)(0/1.8V)	40	40		41	41	PETn0
GND	38				39	**GND**
USB_D-	36	36		37	37	PERp1
USB_D+	34	34		35	35	PERn1
GND	32				33	**GND**
PLA_S3# (O)(0/1.8/3.3V)	30	30		31	31	PETp1
NC	28	Note 3		29	29	PETn1
NC	26	Note 3			27	**GND**
NC	24	Note 3		25	25	PERp2
VIO 1.8 V	22	R4		23	23	PERn2
NC	20	Note 3			21	**GND**
3.3 V	18	R3		19	19	PETp2
3.3 V	16			17	17	PETn2
3.3 V	14				15	**GND**
3.3 V	12			13	13	PERp3
LED_1# (O)(OD)	10	10		11	11	PERn3
PLN# (I)(0/1.8/3.3V)	8	8			9	**GND**
PWRDIS (I)(0/1.8/3.3V)	6	6		7	7	PETp3
3.3 V	4	R1		5	5	PETn3
3.3 V	2				3	**GND**
					1	**GND**

Note 1: ***Label*** is the labled number on the adjacent 0402 SMD shunt package on the ZX122S3MPS module. The listed signal name in table 2 may vary depending to your M.2 design configuration. Please apply your design signal name convention to non-power supply rail signals & GND.
2: The supply power is available on the listed current sense resistor.
3- The listed NC, No Connect, assigned signals for PCISIG M.2 Socket 3 Key M - are not connected between J1 and J2 connectors, therefore they listed pin in open at J1 and J2 connectors.

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CHECKED: M. MARINA

DRAWN: MATTHEW CT

REVISSION: 1.0

SHEET: 2 OF 3

Product Name: **ZX122S3MPS PCISIG M.2 NGFF Socket 3 Key M passive breakout adapter - power measurement module – Page 3 of 3**

Typical Application: ZX122S3MPS 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 ZX122S3MPS module:

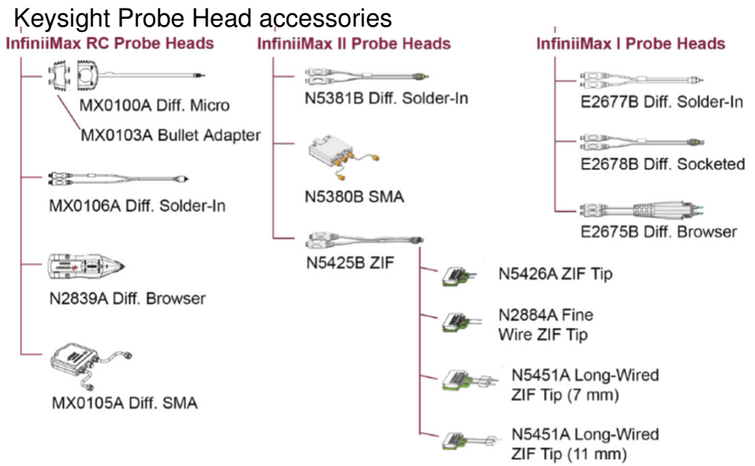
Scope Probe wire Installation:

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. ZX122S3MPS 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.



Power Rating : Onboard current sense resistors on ZX122S3MPS module are designed for maximum power consumption per PCISIG M.2 specification operating within -65℃ to 70℃ 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.

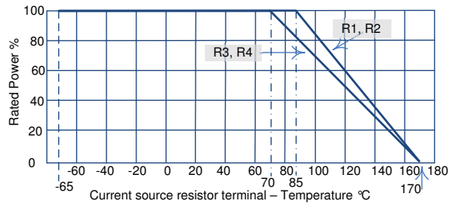
The onboard current sense resistors operate at 100% listed power ratings (see Table 1) within temperature range :
R1, R2 : -65℃ ≤ operating temperatures ≤ 85℃ with tolerance = ±1%
R3, R4 : -65℃ ≤ operating temperatures ≤ 70℃ with tolerance = ±1%

The onboard current sense resistors **power ratings** derail at **above** 70℃. 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 ≥ **+70℃** temperature range :

1- Apply cooling fan where the current sense resistor's terminal blocks are measured at 70℃ – Please note - The ZX122S3MPS 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 ≥ 70℃ 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



Tektronix P6243 scope probe

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