

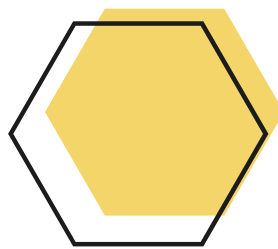


BlackPepper 4 DATASHEET BKP-N2N2-2409



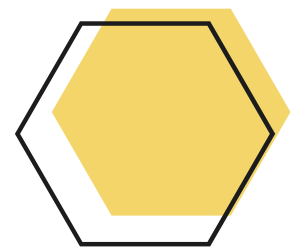
IEEE 802.11 b/g/n

High-Performance, Dual independent Radio operating in ISM 2.4 GHz license-free Band and 900 MHz ISM Band, 2x2 MIMO



Optimized SWaP-C

Size, Weight, Power, Cost
Optimized Radio Module



Industrial grade

-40 deg C to +85 deg C
operation temperature



VIZMONET PTE LTD

21 Woodlands Close, #03-01, Primz Biz Hub, Singapore 737 854
+65 6255 0581 | enquiry@vizmonet.com | <https://vizmonet.com>

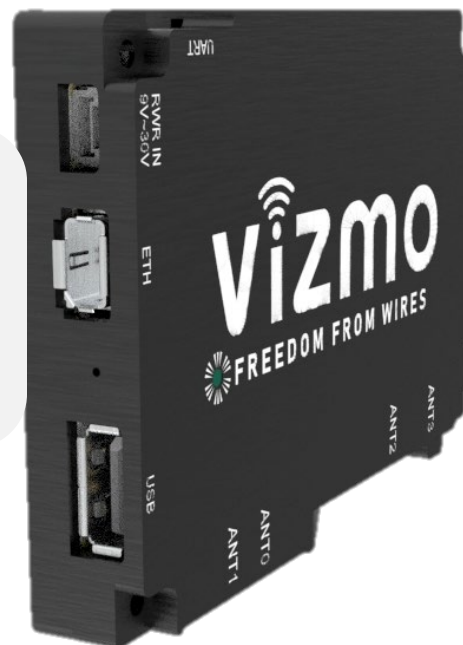
HW REV# 01.00
Last updated on Jun-22-24

SWaP-C Optimized Design



MMCX Antenna Connectors

Industry Standard Connectors for Power, USB and Ethernet Signals



TECHNICAL SPECIFICATION

| RADIO MODULE – GENERAL INFO | |
|--------------------------------|--|
| Radio chipset | Qualcomm QCA 9550-AT4B (CPU) & AR 8033-AL1B (Ethernet PHY) Qualcomm AR 9592-AR1B |
| NOR Flash | SPI Flash, 16MB |
| NAND Flash | NAND Flash, 256 MB |
| RAM | DDR2, 200 MHz, 256 MB (64Mx16x2) |
| Operating System | Linux, OPENWRT, supports open source ath9K Linux driver |
| Security | 128-bit AES, WEP, TKIP and WAPI hardware encryption Support for IEEE 802.11d, e, h, i standards Small packet size (96 Bytes) in AES encryption at full packet rate Loopback mode to assist FIPS AES certification |
| Operating frequency – 11 b/g/n | 2400 MHz to 2483.5 MHz (2S, MIMO) |
| Operating frequency – 11 b/g/n | 902 MHz to 928 MHz (2S, MIMO) |
| Data rate - 1S, SISO | 1 Mbps, 2 Mbps, 5.5Mbps, 111 Mbps (11b) 6Mbps, 9Mbps, 12Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (11g) |
| Data rate - 2S, MIMO | MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7 (11n, 1S,SISO) MCS8, MCS9, MCS10, MCS11, MCS12, MCS13, MCS14, MCS15 (11n,2S,MIMO) |
| Channel BW – 2.4 GHz | 5 MHz/10 MHz/20 MHz /40 MHz |
| Channel BW – 900 MHz | 5 MHz/10 MHz/20 MHz |
| Compliance | RoHS, MIL-STD-810G Shock & Vibration |
| MAC ID | 74E277 Series |
| INTERFACE SPECIFICATIONS | |
| Power | DC in |
| Operating Voltage | 9V to 30V |
| RF Antenna connector | x4 MMCX Female (Jack) connectors |
| ENVIRONMENTAL SPECIFICATIONS | |
| Operating Temperature Range | -40 deg C to +85 deg C |
| PHYSICAL SPECIFICATIONS | |
| Mechanical Dimension | (L) 94.5 mm x (W) 68.6 mm x (D) 14.9 mm |
| Weight | 115 g |
| REGULATORY INFORMATION | |
| Compliance | In Progress |
| PACKAGING INFORMATION | |
| No of units | TBD |

ORDERING INFORMATION

BKP-N2N2-2409

BlackPepper 4, Dual Independent, 2x2 MIMO,
IEEE 802.11 b/g/n, 2.4 GHz, 900 MHz Bands, 29 dBm

RADIO SPECIFICATION

TX/RX Specification – 2412 MHz to 2462 MHz

Sensitivity tested in ART Mode, PSR >=95%, Chain0+Chain1

TX Power per chain (SISO mode) and Sensitivity Tolerance = +/- 2 dBm

Current consumption is measured at the input of the module, powered by 24V DC and it includes idle current drawn by the system.

| Data Rate | TX Power per chain (dBm) | Current 24V (A) | RX Sensitivity (dBm) |
|-----------|--------------------------|-----------------|----------------------|
| 54 Mbps | 20 | 0.230 | -80 |
| 48 Mbps | 21 | 0.245 | -81 |
| 36 Mbps | 23 | 0.265 | -88 |
| 24 Mbps | 25 | 0.290 | -89 |
| 18 Mbps | 25 | 0.290 | -92 |
| 12Mbps | 25 | 0.290 | -94 |
| 9 Mbps | 25 | 0.290 | -95 |
| 6 Mbps | 26 | 0.300 | -96 |
| 11 Mbps | 26 | 0.300 | -91 |
| 5.5 Mbps | 26 | 0.300 | -96 |
| 2 Mbps | 26 | 0.300 | -98 |
| 1 Mbps | 26 | 0.300 | -99 |
| HT20-MCS7 | 19 | 0.220 | -74 |
| HT20-MCS6 | 20 | 0.230 | -75 |
| HT20-MCS5 | 21 | 0.245 | -76 |
| HT20-MCS4 | 22 | 0.255 | -81 |
| HT20-MCS3 | 24 | 0.270 | -85 |
| HT20-MCS2 | 24 | 0.270 | -89 |
| HT20-MCS1 | 24 | 0.270 | -91 |
| HT20-MCS0 | 26 | 0.300 | -93 |
| HT40-MCS7 | 19 | 0.220 | -71 |
| HT40-MCS6 | 20 | 0.230 | -72 |
| HT40-MCS5 | 21 | 0.245 | -73 |
| HT40-MCS4 | 22 | 0.255 | -78 |
| HT40-MCS3 | 24 | 0.270 | -82 |
| HT40-MCS2 | 24 | 0.270 | -86 |
| HT40-MCS1 | 24 | 0.270 | -88 |
| HT40-MCS0 | 26 | 0.300 | -90 |

TX/RX Specification – 902 MHz to 928 MHz

Sensitivity tested in ART Mode, PSR >=95%, Chain0+Chain1
 TX Power per chain (SISO mode) and Sensitivity Tolerance = +/- 2 dBm
 Current consumption is measured at the input of the SBC with the 900 MHz radio module connected to it. The current consumption figures are then adjusted so that they only include extra current drawn by the 900 MHz radio module

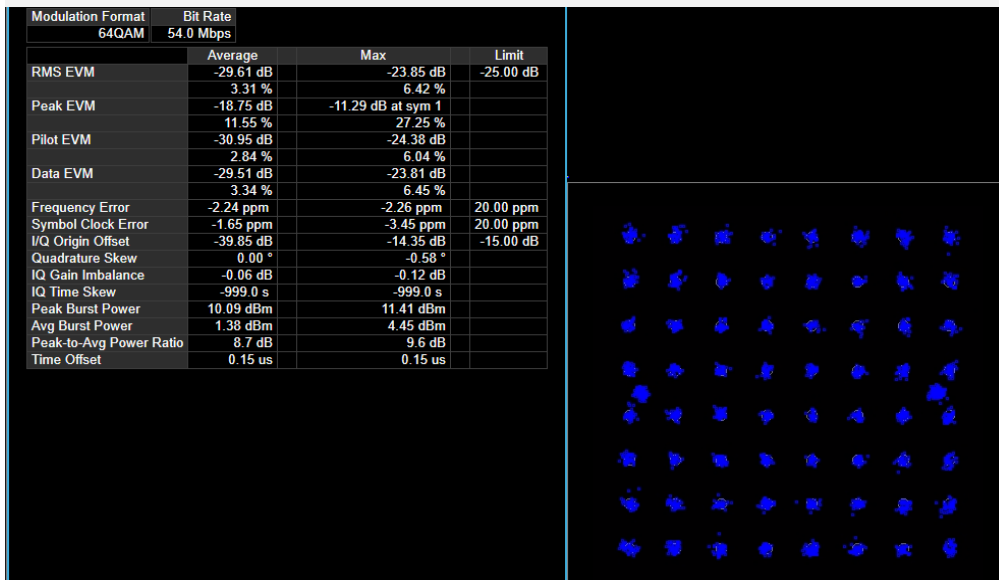
| Data Rate | TX Power per chain (dBm) | DC Power at 24V (W) | RX Sensitivity (dBm) |
|-----------|--------------------------|---------------------|----------------------|
| 54 Mbps | 20 | 4.3 | -77 |
| 48 Mbps | 22 | 4.8 | -80 |
| 36 Mbps | 24 | 5.3 | -82 |
| 24 Mbps | 26 | 6.7 | -85 |
| 18 Mbps | 26 | 6.7 | -87 |
| 12Mbps | 26 | 6.7 | -89 |
| 9 Mbps | 26 | 6.7 | -92 |
| 6 Mbps | 26 | 6.7 | -94 |
| 11 Mbps | 26 | 6.7 | -88 |
| 5.5 Mbps | 26 | 6.7 | -93 |
| 2 Mbps | 26 | 6.7 | -95 |
| 1 Mbps | 26 | 6.7 | -96 |
| HT20-MCS7 | 20 | 4.3 | -68 |
| HT20-MCS6 | 21 | 4.5 | -70 |
| HT20-MCS5 | 21 | 4.5 | -74 |
| HT20-MCS4 | 24 | 5.3 | -78 |
| HT20-MCS3 | 26 | 6.7 | -81 |
| HT20-MCS2 | 26 | 6.7 | -84 |
| HT20-MCS1 | 26 | 6.7 | -89 |
| HT20-MCS0 | 26 | 6.7 | -91 |

Channel Mapping – 902 MHz to 928 MHz

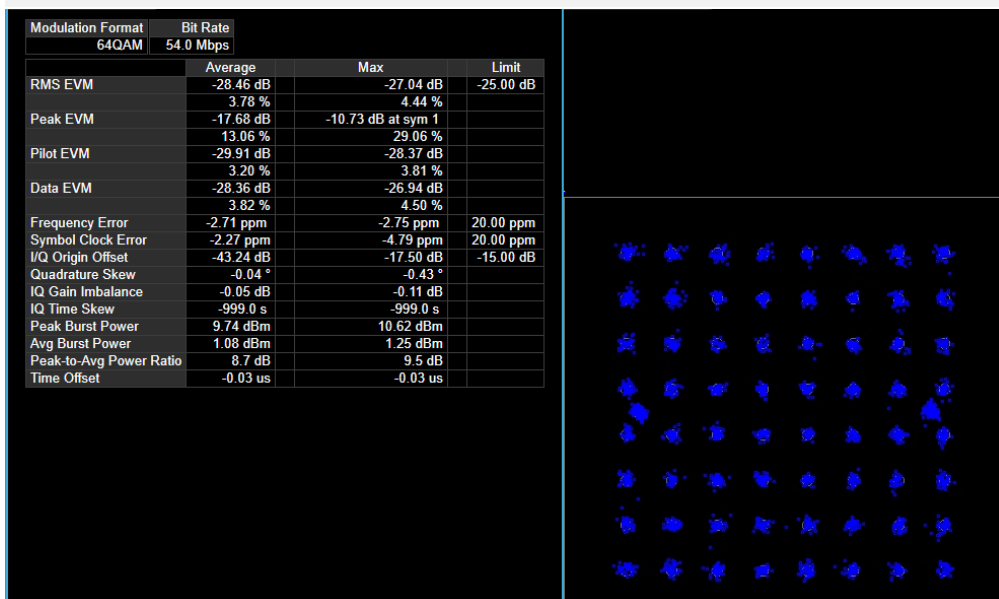
| BASE BAND (MHz) | OP FREQ (MHz) | CH BW (MHz) | STANDARD (11b/g/n) |
|-----------------|---------------|-------------|--------------------|
| 2427 | 907 | 5/10 | 11g/n |
| 2432 | 912 | 5/10/20 | 11b/g/n |
| 2437 | 917 | 5/10/20 | 11b/g/n |
| 2442 | 922 | 5/10 | 11g/n |

EVM PERFORMANCE

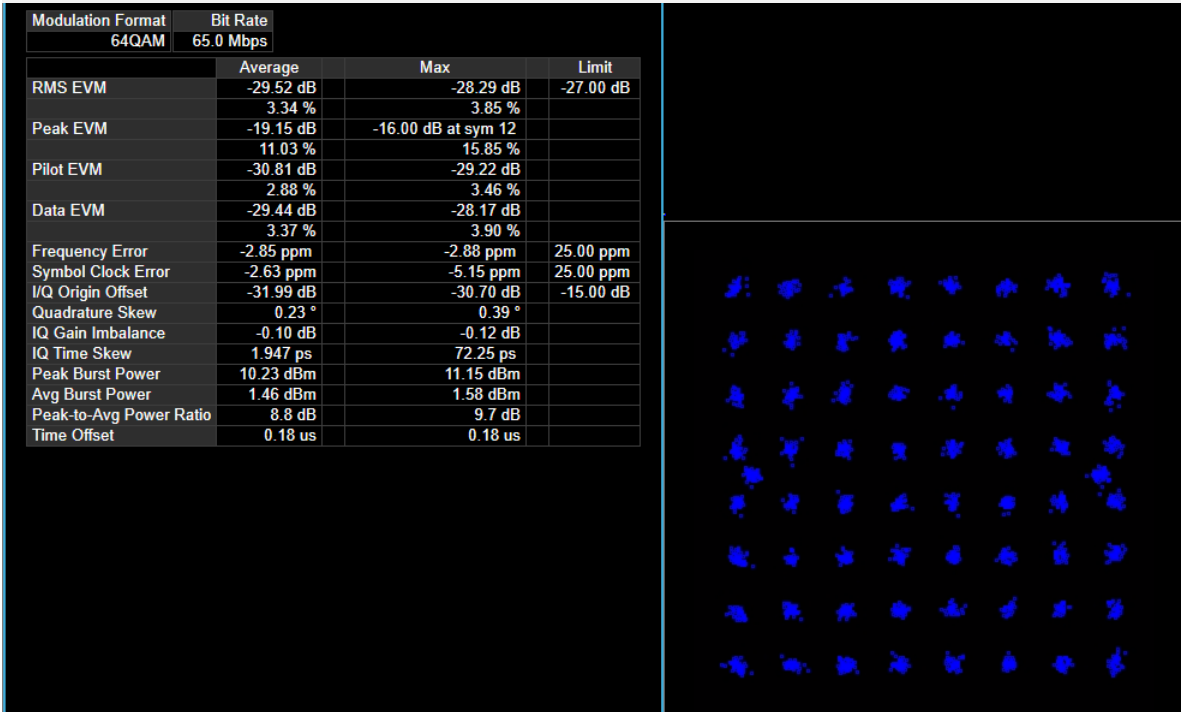
Frequency = 912 MHz, 802.11g, 54 Mbps, CH0



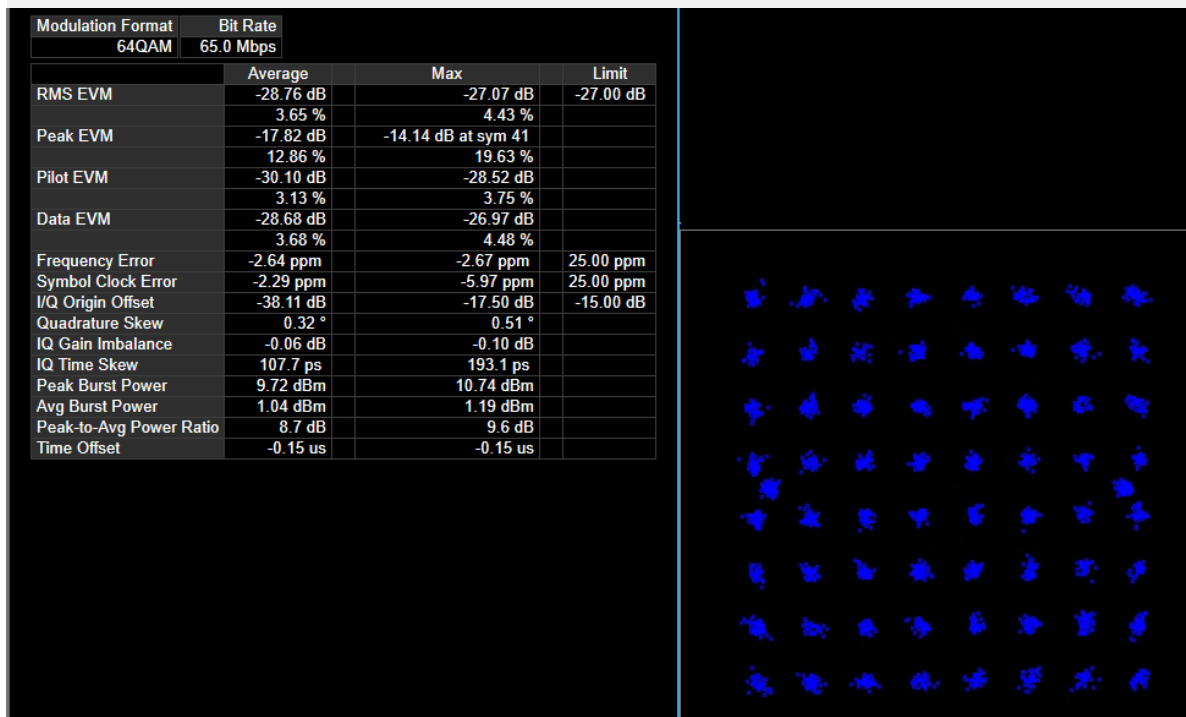
Frequency = 912 MHz, 802.11g, 54 Mbps, CH1



Frequency = 912 MHz, 802.11n, MCS7 (65Mbps), CH0

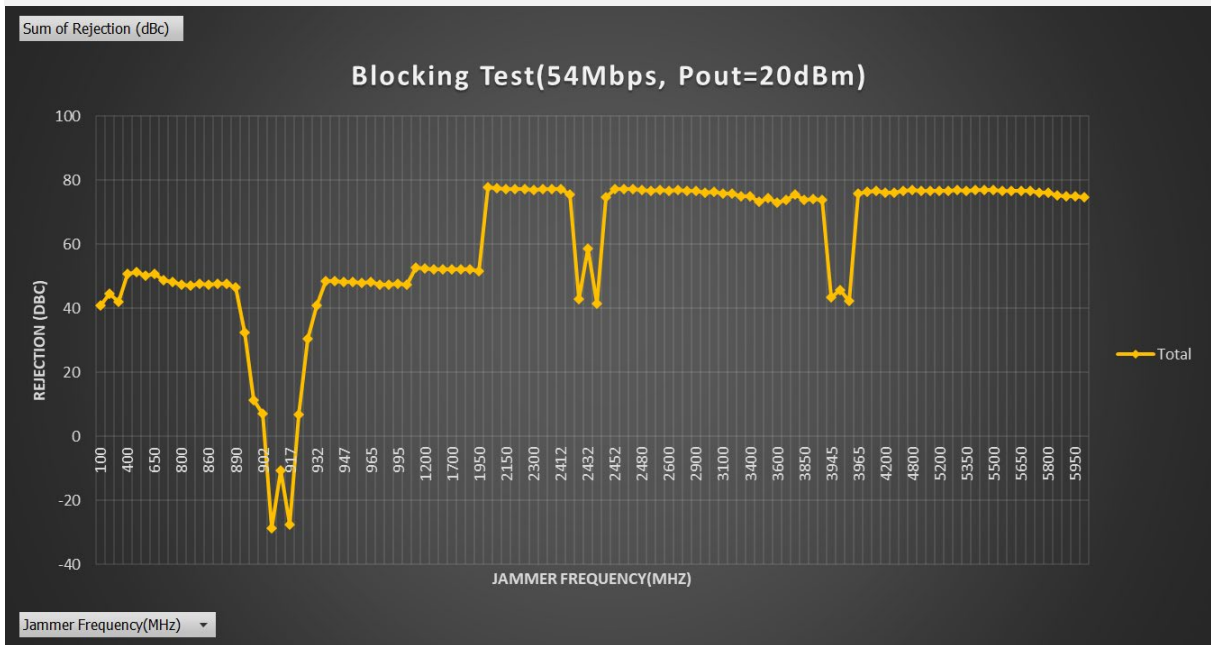


Frequency = 912 MHz, 802.11n, MCS7 (65Mbps), CH1



Interference Desensitization

Frequency = 912 MHz, 802.11g, 54 Mbps



Data rate vs Attenuation (MIMO)

Frequency = 912 MHz, 802.11 b/g/n mode, MIMO

| Att (dB) | BW (MHz) | WR (Mbps) | BW (MHz) | WR (Mbps) | BW (MHz) | WR (Mbps) |
|----------|----------|-----------|----------|-----------|----------|-----------|
| 86 | 20 | 144.4 | 10 | 72.2 | 5 | 36.1 |
| 106 | 20 | 57.7 | 10 | 39 | 5 | 19.5 |
| 120 | 20 | 11 | 10 | 7.2 | 5 | 3.6 |

Legends

Att – RF Attenuation between Transmitter and Receiver
 BW – Channel Bandwidth
 WR – Working Rate

CONNECTION DETAILS

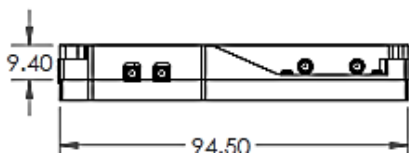
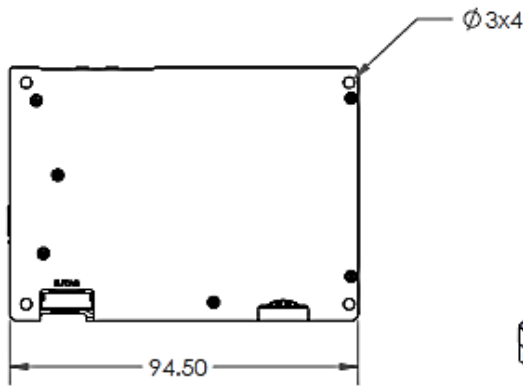
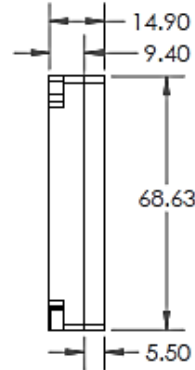
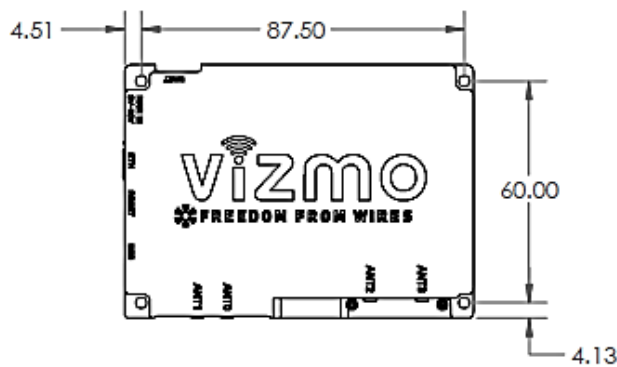


| REF | PART |
|-----|---|
| 1 | MMCX Connector, 2.4 GHz |
| 2 | MMCX Connector, 2.4 GHz |
| 3 | MMCX Connector, 900 MHz |
| 4 | MMCX Connector, 900 MHz |
| 5 | Power Connector, JST SM04B-GHS-TB |
| 6 | Ethernet Connector, HIROSE IX60G-A-10P |
| 7 | USB Connector for thumb drive |
| 8 | RGB LED |
| 9 | USB Micro-B Connector for UART |
| 10 | JST SM08B-GHS-TB for EJTAG (On bottom side) |

CONNECTION PIN-OUT

| PIN# | PIN DESCRIPTION |
|---|--------------------|
| Ant-0 | 2.4 GHz Ant-0 |
| Ant-1 | 2.4 GHz Ant-1 |
| Ant-2 | 900 MHz Ant-0 |
| Ant-3 | 900 MHz Ant-1 |
| JST SM04B-GHS-TB – Pin-1 (from left-to-down on Top side) | 9V to 30V DC POWER |
| JST SM04B-GHS-TB – Pin-2 (from left-to-down on Top side) | 9V to 30V DC POWER |
| JST SM04B-GHS-TB – Pin-3 (from left-to-down on Top side) | GND |
| JST SM04B-GHS-TB – Pin-4 (from left-to-down on Top side) | GND |
| JST SM08B-GHS-TB – Pin-1 (from left-to-right on Top side) | GND |
| JST SM08B-GHS-TB – Pin-2 (from left-to-right on Top side) | EJTAG-TCK |
| JST SM08B-GHS-TB – Pin-3 (from left-to-right on Top side) | EJTAG-TDI |
| JST SM08B-GHS-TB – Pin-4 (from left-to-right on Top side) | EJTAG-TDO |
| JST SM08B-GHS-TB – Pin-5 (from left-to-right on Top side) | EJTAG-TMS |
| JST SM08B-GHS-TB – Pin-6 (from left-to-right on Top side) | RST_B |
| JST SM08B-GHS-TB – Pin-7 (from left-to-right on Top side) | 2.5V DC |
| JST SM08B-GHS-TB – Pin-8 (from left-to-right on Top side) | GND |

MECHANICAL DIMENSIONS



Trademarks

The information in this document is being provided in connection with Vizmonet products, which are subject to continuous developments and improvements. While every effort is made to ensure that the information contained in this document is correct and accurate at the time of this printing, Vizmonet makes no representations or warranties with respect to the accuracy of the information and is not liable for errors or mistakes that may arise. However, Vizmonet reserves the right to make changes to specifications and product descriptions at any time without notice. Vizmonet does not assume any responsibility for the use of the described product; neither does it convey any license under its patent rights, or the rights of others. Vizmonet products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life. Built-to-Customize™ is a trademark of Vizmonet. All other trademarks, registered trademarks and product names are the sole property of their respective owners.

Contact

Web: <https://vizmonet.com>
Email: enquiry@vizmonet.com

Headquarters

Vizmonet Pte Ltd
21, Woodlands Close
#03-01, Primz Biz Hub
Singapore 737 854