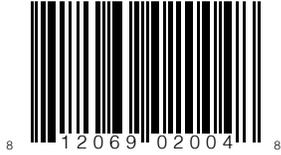


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MPN

**AEX-QCA9880-NX**

UPC



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PRODUCT PAGE

EVALUATION / REQ



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SAMPLES



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# 1.3Gbps Three Chain, Dual Band 802.11ac/abgn WLAN – Extended Temperature Grade, Full Size MiniPCle Express Module

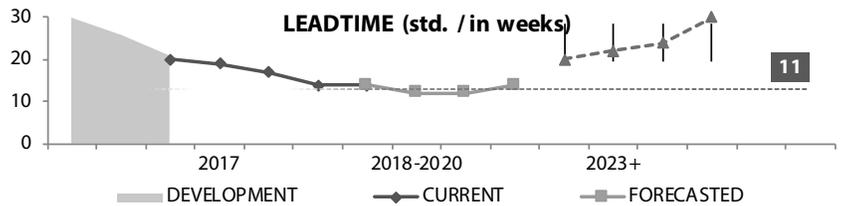
Based on QUALCOMM ATHEROS Reference Design XB140 (Peregrine)

## DATASHEET



A	B	A	2	2	11 weeks
TECHPOINT	LIFESPOT	VAROD	VERTICALS	DCO	ELT

\* Page 2 for key legend. Commercial data refresh: July 2018



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## Revision History

Releases	Date	Notes	Prepared	Approved
Version 0.1	2013/09/02	Draft Version	Brian	RChang
Version 1.0	2013/12/09	Official Release Specifications	James	LTu
Version 1.1	2014/01/10	Update General Specifications Add Module Photos	Wang	LTu
Version 1.2	2014/05/30	Aligned PID to Qualcomm-Atheros Added Market Orientation Index	James	LTu
Version 1.3	2015/06/18	Spellings and typo corrections Updated Mechanical Drawing	James	LTu
Version 1.4	2017/02/06	Name of chipset correction	Joanna	Chris
Version 1.5	2018/07/05	Updated Leadtime and Pin Layout	A Stamatis	LTu

### \* Commercial Key Legend

Indicators that assess the specific product for its position in the technology curve and the supply chain responsiveness it enjoys. They combine an inner-outer view: both from outside factors and from internal corporate and production support.

<b>MOI [Market Orientation Index]</b>	A value calculated from the grading of the factors below. Used as a rule-of-thumb to aid design-in and procurement evaluation. MOI depicts the present product affinity to Innovation (I), Customer Empathy (C) and Price Focus (P).
<b>TECHPOINT</b>	The position of the product within the specific technology-innovation curve for its class. VALUES: Advanced (A), Barring (B), Common (C), Dissolving (D).
<b>LIFESPOT</b>	Estimated lifespan indicator. VALUES: Agonist (A), Bold (B), Current (C), Distressed (D); the earlier the letter the earlier the position in the specific product lifecycle.
<b>VAROD [Variants On-Demand]</b>	An indicator of the depth and difficulties On-Demand product variations can reach and encounter. VALUES: Auxiliary (A), Basic (B), Core (C), Deep (D).
<b>VERTICALS</b>	It is an index of the spread of product applications in different vertical markets. VALUES: 1 to 4; the more the target markets the higher the number, the less the product specificity to markets.
<b>DCO [Design Cost Orientation]</b>	Commodity index related to the cost point for the product's design conception. VALUES: 1 to 4; the higher the number the more cost aware is the core design.
<b>ELT [Effective Lead Time]</b>	Adjusted lead-time in weeks. This is a compound value based on the timeframe for the fulfillment of the 90% of unscheduled orders received accounting also for the industrial lead-time and internal inventory buffering. VALUE: number of ELT weeks.

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<b>1.3GBPS THREE CHAIN, DUAL BAND 802.11AC/ABGN WLAN – EXTENDED TEMPERATURE GRADE, FULL SIZE MINIPCIE EXPRESS MODULE</b>	<b>1</b>
<b>REVISION HISTORY</b>	<b>2</b>
<b>* COMMERCIAL KEY LEGEND</b>	<b>2</b>
<b>DESCRIPTION</b>	<b>4</b>
<b>TOP FEATURES</b>	<b>4</b>
<b>SPECIFICATIONS</b>	<b>5</b>
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## 1. Description

**11AC Dual Band (DB):** The AEX-AR99880-NX Series IEEE 802.11ac/abgn PCI-E WLAN is the first Qualcomm-Atheros Dual Band modular design compliant with the IEEE 802.11AC standard. It follows the 11AC protocol by supporting wider channel bandwidth (80 MHz) at 5Ghz and wider 256-QAM, plus other features that improve network bandwidth, reliability and the efficiency of wireless connections.

**New Performance Heights:** With advanced QFN, On-chip CPU for Host Wi-Fi offload, 80Mhz channel bandwidth, 4 Gbit/s bus bandwidth, evolved QAM base band modulation technologies and 1.3Gbps WLAN peak throughput the AEX-QCA9880-NX is setting new standards.

**Extended Temperature Grade:** The AEX-QCA9880-NX is built with end quality components from the multi-layered PCB to the front end high quality RF and qualifies also through extended testing for operating temperature ranges from -20° to +70° Celsius.

## 2. Top Features



- IEEE 802.11ac Dual Band (backwards compatible with 802.11abgn)
- Extended operating temperature grade (-20°C ~ 70°C)
- Three antenna connectors, for MIMO 3Tx3R (3 Transmit & 3 Receive) technology
- Transmission Beamforming (TxBF) with enhanced Tx power accuracy and high aggregate power
- PCI-E 2.0 standard specification with up to 4 Gbit/s bandwidth (backwards compatible to 1.x)



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### 3. Specifications

SOLUTION DESIGN	<b>Chipset</b>	Qualcomm Atheros QCA9880-BR4A (Peregrine)
	<b>Standard</b>	IEEE 802.11 a/b/g/n/ac Wi-Fi
	<b>Industrial Reference</b>	Qualcomm Atheros reference design XB140 Version 2
APPEARANCE	<b>Communications Interface</b>	Mini PCIE format, PCI Express Standard 2.0 host I/O
	<b>Form Factor</b>	Mini PCIE format, standard mPCIe dimensions – Full size card
ANTENNA	<b>Configuration</b>	Three Streams (3 chains), 3x3, 3 Connectors, MIMO
	<b>Type</b>	Three on board I-PEX U.FL antennas
WIRELESS PARAMETERS	<b>Frequency Band</b>	2.4 GHz ISM Bands 2.412-2.472 GHz, 2.484 GHz 5.15-5.25 GHz (FCC UNII-low band) for US/Canada, Japan and Europe 5.25-5.35 GHz (FCC UNII-middle band) for US/Canada and Europe 5.47-5.725 GHz for Europe 5.725-5.825 GHz (FCC UNII-high band) for US/Canada
	<b>Data Transfer Rates</b>	WLAN 2.4GHz: 11n: Up to 450Mbps (dynamic) 11g: Up to 54Mbps (dynamic) 11b: Up to 11Mbps (dynamic) WLAN 5GHz: 11ac: Up to 1300Mbps (dynamic) 11n: Up to 450Mbps (dynamic) 11a: Up to 54Mbps (dynamic)
	<b>Media Access Control</b>	CSMA/CA with ACK
	<b>Channel</b>	2.4GHz: 1-13 (14 only for Japan) 5GHz: 36-48 149-165
	<b>Channel Spacing</b>	5MHz
	<b>Spreading / Modulation</b>	802.11ac/g/n: OFDM (BPSK, QPSK, 16-QAM, 64-QAM), MRC, STBC, LDPC, ML Demodulation 802.11b: CCK (11, 5.5Mbps), DQPSK (2Mbps), BPSK (1Mbps)



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	<b>RF Output Power</b>	802.11a: Typical 13 dBm at 54M / 16dBm at 6M +/- 2dBm 802.11b: Typical 18dBm +/- 2 dBm 802.11g: Typical 13 dBm at 54M / 18dBm at 6M +/- 2dBm 802.11n 5G HT20 : Typical 21 dBm at MCS0 / 16dBm at MCS7 +/- 2dBm 802.11n 5G HT40 : Typical 21 dBm at MCS0 / 16dBm at MCS7 +/- 2dBm 802.11n 2.4G HT20 : Typical 22 dBm at MCS0 / 16dBm at MCS7 +/- 2dBm 802.11n 2.4G HT40 : Typical 22 dBm at MCS0 / 16dBm at MCS7 +/- 2dBm 802.11ac 5G VHT20 : Typical 21 dBm at MCS0 / 15dBm at MCS8 +/- 2dBm 802.11ac 5G VHT40 : Typical 21 dBm at MCS0 / 15dBm at MCS8 +/- 2dBm 802.11ac 5G VHT80 : Typical 21 dBm at MCS0 / 14dBm at MCS8 +/- 2dBm
		<ul style="list-style-type: none"> <li>DBm values reflect single RF chain output power performance.</li> <li>Three chain combined output power can be calculated as the single chain output power above plus 5dB (3Tx = 1Tx + 5dB).</li> </ul>
	<b>RF Receive Sensitivity (Typical)</b>	802.11a: 54M less than -70 dBm 802.11b: 11M less than -85 dBm 802.11g: 54M less than -70 dBm 802.11n 2.4G: HT20 MCS7 less than -72 dBm HT40 MCS7 less than -69 dBm 802.11n 5G: HT20 MCS7 less than -72 dBm HT40 MCS7 less than -69 dBm 802.11ac 5G: VHT20 MCS8 less than -68 dBm
	<b>Operating Range</b>	Open Space: ~300 m; Indoor: ~100 m (Coverage vary according to environment, antenna and topography)
	<b>Wireless Security</b>	WEP 64-bit and 128-bit encryption WPA (Wi-Fi Protected Access) WPA2 (Wi-Fi Protected Access)
<b>WORKING MODES</b>	Infrastructure, Client, Bridge, Ad-hoc	
<b>SAFETY, EMISSION &amp; REGULATORY</b>	Compliant with FCC, CE and IC. Compliant with RoHS.	
<b>PROTOCOLS</b>	<b>IEEE WLAN Network</b>	802.11ac, 802.11n , 802.11g, 802.11b, 802.11a, 802.11d, 802.11e, 802.11j and 802.11i
	<b>Other Standards</b>	
	<b>Industry Standards</b>	
<b>HOST SYSTEM REQUIREMENTS</b>	<b>Operating System</b>	Linux, Linux Open Source, Qualcomm-Atheros Embedded Platform (Windows on request)
<b>ENVIRONMENT</b>	<b>Operating Temperature</b>	-20° ~ +70° Celsius
	<b>Storage Temperature</b>	-40° ~ +80° Celsius
	<b>Operating Humidity</b>	10%~90% non-condensing
	<b>Storage Humidity</b>	5%~90% non-condensing
<b>ELECTRICAL</b>	<b>I/O Voltage</b>	3.3V +/-5%

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	<b>Power Consumption</b>	Transmit Packet Test HT 40*: Receiver Packet Test HT 40*:	TBC mA max TBC mA max
MECHANICAL	<b>Dimensions</b>	50.95mm x 30mm x 3.15mm (with shielding)	
	<b>Weight</b>	6.1 g	
PACKAGING	<b>Packing style</b>	ESD Sleeves in Carton Bulk Package	
	<b>Package Contents</b>	AEX-AR9880-NX IEEE 802.11 ac/abgn mPCI-E modules	

## 4. Ratings / Characteristics

### 4-1. Absolute Maximum Ratings

Symbol	Parameter	Max. Rating	Unit
V <sub>dd33</sub>	Maximum I/O supply voltage	3.63	V
RFin	Maximum RF input (reference to 50 Ω)	+10	dBm
T <sub>store</sub>	Storage temperature	-40~+80	°C

### 4-2. Recommended Operating Conditions

Symbol	Parameter	Rating	Unit
V <sub>dd33</sub>	I/O voltage	2.97~3.63	V

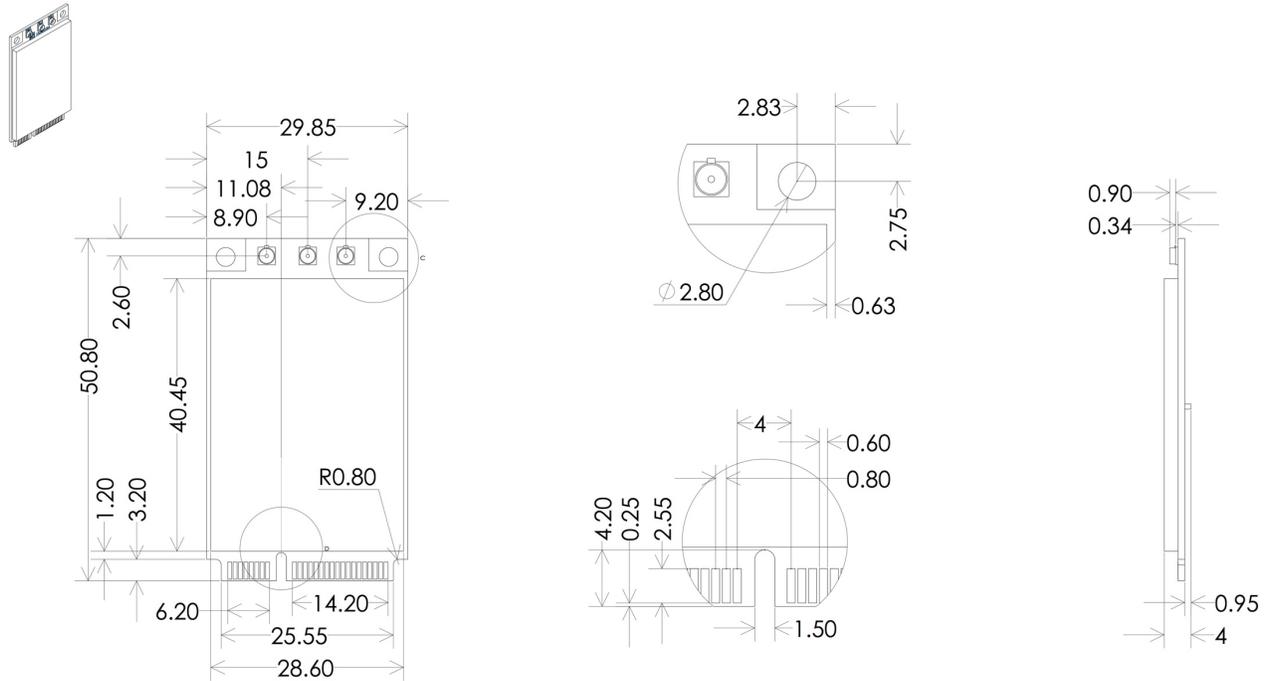
### 4-3. GPIO Interface Characteristics

Signal Name (To chip GPIO PIN)	Mini PCI-E PIN	Type	Driver	PU/PD Resistance
WLAN_LED	44	O	24 mA (Max)	1 KΩ PD
WLAN_DISABLE	20	I	–	10 KΩ PU



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## 5. Mechanical Drawing



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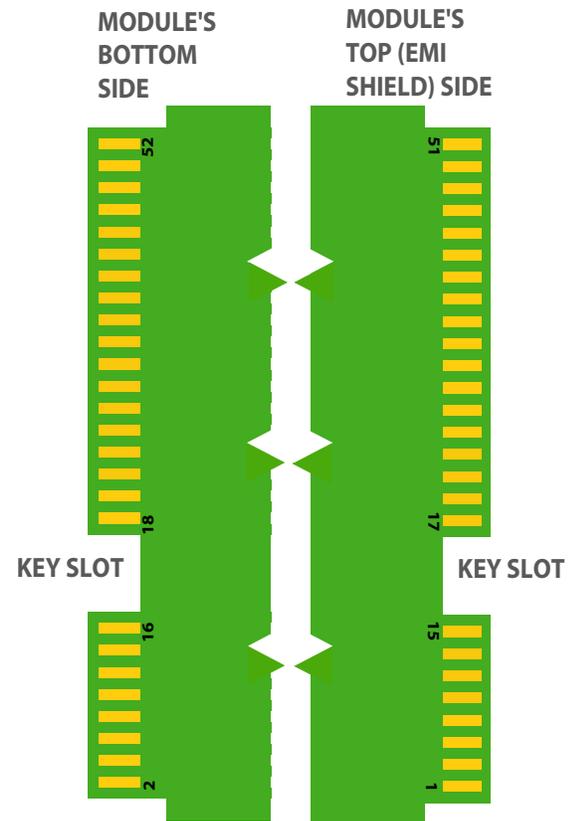
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## 6. Connector Pin-out Definitions

Pin No.	Definition	Basic Description	Type
1	PCIE_WAKE_L	PCIe Wake	Output
2	+3.3V aux	3.3V power supply	Power
4	GND	Ground	GND
7	CLKREQ_L	Reference clock request, open drain	Output
9	GND	Ground	GND
11	REFCLK-	Differential reference clock	Input
13	REFCLK+	Differential reference clock	Input
15	GND	Ground	GND
18	GND	Ground	GND
20	W_DISABLE_L	WLAN disable control. Low disables WLAN. Module P.U	Input
21	GND	Ground	GND
22	PERST_L	PCI express fundamental reset	Input
23	PERn0	Differential transmit (PCIE_TX_N)	Output
24	+3.3V aux	3.3V power supply	Power
25	PERp0	Differential transmit (PCIE_TX_P)	Output
26	GND	Ground	GND
27	GND	Ground	GND
29	GND	Ground	GND
31	PETn0	Differential receive (PCIE_RX_N)	Input
33	PETp0	Differential receive (PCIE_RX_P)	Input
34	GND	Ground	GND
35	GND	Ground	GND
37	GND	Ground	GND
39	+3.3V aux	3.3V power supply	Power
40	GND	Ground	GND
41	+3.3V aux	3.3V power supply	Power
43	GND	Ground	GND
44	LED_WLAN_L	Active low signal. The signal is used to provide WLAN LED indicate	Output
46	LED_WPAN_L	Active low signal. The signal is used to provide BT LED indicate	Output
50	GND	Ground	GND
52	+3.3V aux	3.3V power supply	Power

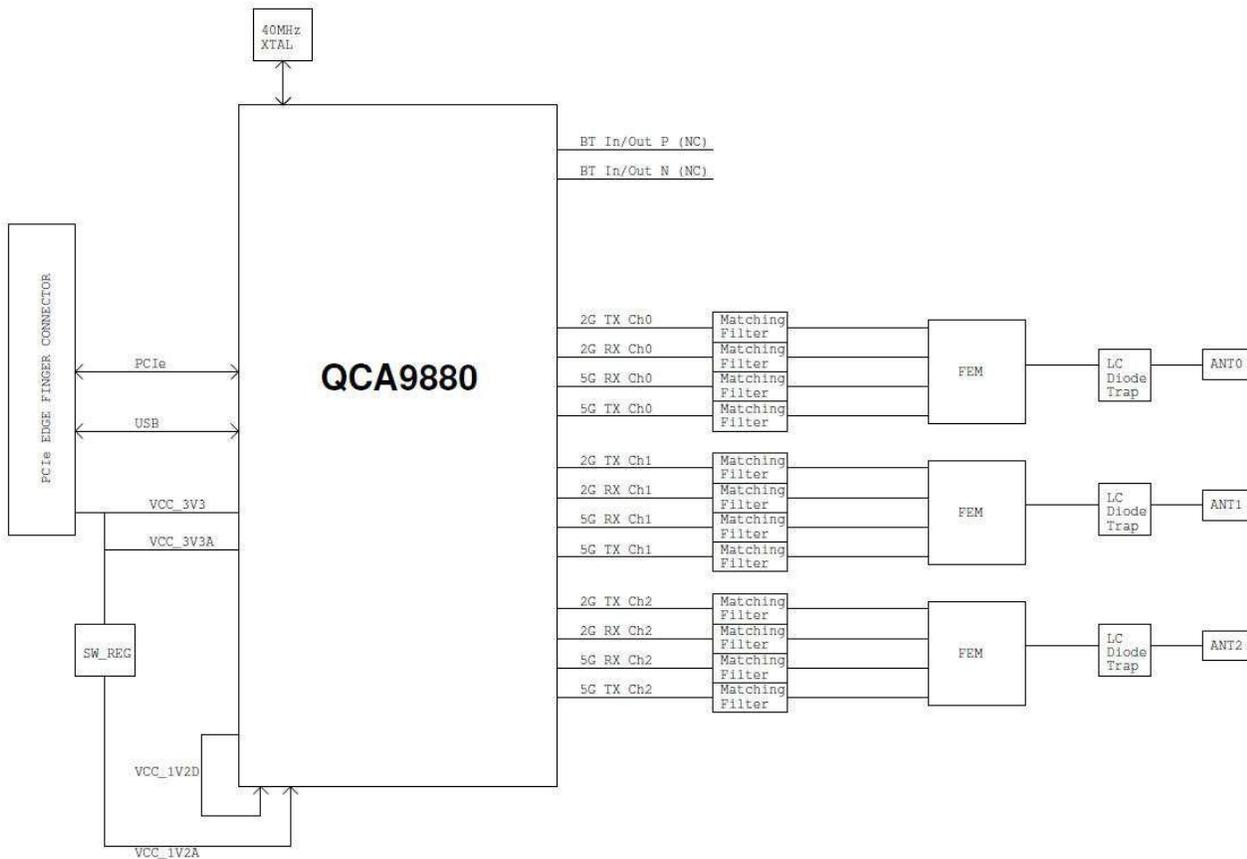
Interface type	Bus Signaling	Standard
NGFF Edge	PCIe	PCI-SIG v1.1

\* Physical Layer Form Factor follows standard PCIe definitions. Graphic representation below.  
 \*\* Pin/Contact Numbers not appearing in the pinout table are either reserved or unused.



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## 7. Block Diagram



## 8. Environmental Performance Qualification

At the time of writing this document, throughput test at controlled thermal conditions are to be scheduled. Any related enquiries can be addressed to your sales / account manager.



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## 9. Standard Domain Code & Identification

The Regulatory Domains pre-programmed as standard are 0x6c,0x1f.

Other regulatory domain codes can be pre-programmed on-request at production batch level.

Implemented as standard are identifiers following Qualcomm Atheros XB140 reference design:

	Vendor ID (VID)	Subststem Vendor ID (SVID)	Device ID (DID)	Subsystem ID (SSID)
STANDARD WLAN	0x168C	n/a	0x3C	n/a

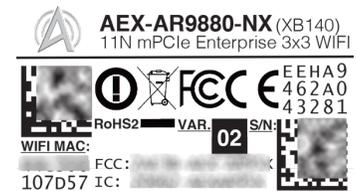
## 10. Product Label

### 10-1. Front (Shield) Side Regulatory Label

Standard label is shown here. It includes the required marking for the following regulatory areas: FCC (USA), ETSI (Europe), EU Safety & Environmental.

Wireless LAN NIC MAC ID label (human legible and barcode).

Serial Number label (human legible and barcode) plus Variant Number.



### 10-3. On-Demand Labeling

Labels can be tailored to report customer's part number and regulatory compliance following Qualcomm Atheros XB140 reference design certifications for any of the countries and domains required.

## 11. ESD Processes

See Notices appended.



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## 12. Standard Packaging, Storage & Shipping

ESD Sleeve, Inner Box & Outer Carton level standard packing schematic \* :



	Module in ESD Sleeve	Inner Box Kit (K)	Master Carton (M)
<b>CONTENT (UNITS)</b>	1	60	960
<b>INVENTORY SKU</b>	AEX-QCA9880-NX	AEX-QCA9880-NX-K	AEX-QCA9880-NX-M
<b>OUTER DIMENSIONS</b>	70 x 60 x 3.5 mm	204 x 165 x 65 mm	430 x 350 x 285 mm
<b>GROSS WEIGHT</b>	6.2 gr	430 gr	8000 gr
<b>PICK &amp; PACK METHOD</b>	Padded envelope or carton box depending on quantity. Padded & separated.	In outer carton packaging.	As-is.
<b>PACKAGING COMPLIANCE **</b>	ANSI/ESD S20.20, IEC 61340-5-1, RoHS2	RoHS2	RoHS2
<b>HTS CODE (HS)</b>	8517.62	8517.62	8517.62
<b>NAFTA / ECCN</b>	On request	On request	On request

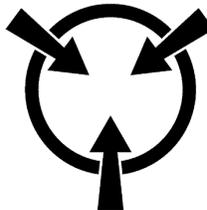
\* Packaging modality and artwork can be designed as per customer's requirements.

\*\* The Packaging modality and the selection of its materials is made with environmental responsibility and commitment to resource preservation. Please reuse and recycle where possible.

The AEX-QCA9880-NX constitutes a sensitive electronic device and caution is required when handling it. ESD handling, shipment and storage notices apply:



**DO NOT OPEN OR  
HANDLE EXCEPT AT A  
STATIC-FREE  
WORKSTATION**



**DO NOT SHIP OR STORE NEAR  
STRONG ELECTROSTATIC,  
ELECTROMAGNETIC OR  
RADIOACTIVE FIELDS**

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## 13. Ordering Information

Public variants, their differential characteristics and ordering information:

	Ordering P/N	Variant IDs	Description
<b>STANDARD PRODUCT</b>	AEX-AR9880-NX	A / 02	- Standard product - Standard packaging



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## 14. NOTICES

**STORAGE:** The product shall be stored and the package shall remain closed according to storage environmental conditions noted within this datasheet.

- The product shall be stored in non-corrosive gas (Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>2</sub>, Nox, etc.). - No excess mechanical shock shall be applied including, but not limited to, sticking the packing materials by sharp object and dropping the product, in order to avoid damaging the packing materials.

**SHELF LIFE:** Products left more than two years after reception need to have their specifications confirmed prior to use.

**HANDLING:** Care in handling or transporting products is required as excessive stress or mechanical shock may break products. – Cracks or damages on products' terminals may lead to changes in their characteristics. Products are not to be touched with bare hands as this may result in electrostatic damage. - Application of static electricity or overvoltage may cause defect in the product or deterioration of its reliability, and caution must be taken against exposure to any static electricity generated by electrified items such as workbenches, soldering irons, tools, carrying containers, etc.

**LAND PATTERN & DIMENSIONS:** All ground terminals should be connected to the ground patterns. Furthermore, the ground pattern should be provided between IN and OUT terminals. Please refer to the specifications for standard land dimensions.

**MECHANICAL PLACEMENT:** When mounting products connected to other components, products may be stressed and broken by uneven forces. To prevent such damages, compliance with specifications for the tools and interfaces being used is required.

**CLEANING:** As this Product is Moisture Sensitive, no cleaning is permitted.

**OPERATIONAL ENVIRONMENTAL CONDITIONS:** Products are designed to work as part of electronic compositions under normal environmental conditions (ambient temperature, humidity and pressure). Operation under the following circumstances may damage the products and leakage of electricity and abnormal temperature may occur:

- In an atmosphere containing corrosive gasses (Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>x</sub>, NO<sub>x</sub>) or combustible and volatile gases - Dusty places – Places of direct sunlight
- Water splashing places - Humid places where water condenses - Freezing places - etc.

In the instance of potential operation in such environments, consult with AIRETOS before actual use. Application of static electricity or excessive voltage while assembling and measuring is discouraged as it might be a cause of degradation or destruction.

**INPUT POWER CAPACITY:** Products shall be used in the input power capacity specified in this datasheet. If components are to be used beyond the documented input power capacity range, prior consultation with AIRETOS is advised.

**LIMITATION OF APPLICATIONS:** The product is designed and manufactured for consumer application only and is not available for any application listed below which requires significantly high reliability for the prevention of defects that may directly cause damage to the third party's life, body or property.

- Aircraft equipment - Aerospace equipment - Undersea equipment - Power plant control equipment - Medical equipment - Transportation equipment (vehicles, trains, ships, etc.) - Traffic signal equipment - Disaster prevention / crime prevention equipment - Data-processing equipment - Application of similar complexity and/ or reliability requirements to the applications listed in the above.

If the product is to be used in equipment or electric circuit that requires high safety or reliability function / performances, sufficient reliability evaluation check for safety shall be performed prior to commercial shipment and consideration for the installation of a protective circuit at customer's design stage is strongly recommended. Please provide and appropriate fail-safe function on the customer's product to prevent any damages that may be caused by the abnormal function or the failure of our product.

**QUALITY CONTROL:** Testing and other quality control techniques are applied to the extent AIRETOS deems necessary. Unless mandated by government requirements, AIRETOS does not necessarily test all parameters of each product.

**LIFECYCLE:** Please note that AIRETOS may discontinue the manufacture of products, due to reasons such as end of supply of materials and/or components from our suppliers.

**CONFORMITY:** Please make sure that your product has been evaluated and confirmed against your specifications when the AIRETOS product is mounted to your product. Please conduct validation and verification of the products in actual condition of mounting and operating environment before commercial shipment of the equipment. All the items and parameters in this product specification have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment agreed upon between you and us. You are requested not to use our product deviating from such agreement. We consider it not appropriate to include other terms and conditions for transaction warranty in product specifications, drawings or other technical documents. Therefore, even if your original part of this product specification includes such terms and conditions as warranty clause, product liability clause, or intellectual property infringement liability clause, we are not able to accept such terms and conditions in this product specification unless they are based on the governmental regulation or what we have agreed otherwise in a separate contact. We would like to suggest that you propose to discuss them under negotiation of contract.

**DISCLAIMER:** Please note that the only warranty that AIRETOS (DBA part of the VoxMicro LTD Group) provides regarding the products is its conformance to the specifications provided herein. Accordingly, AIRETOS shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this specification.

AIRETOS HEREBY DISCLAIMS ALL OTHER WARRANTIES REGARDING THE PRODUCTS, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THAT THEY ARE DEFECT-FREE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. YOU AGREE TO INDEMNIFY AND DEFEND AIRETOS AND ITS AFFILIATES AGAINST ALL CLAIMS, DAMAGES, COSTS, AND EXPENSES THAT MAY BE INCURRED, INCLUDING WITHOUT LIMITATION, ATTORNEY FEES AND COSTS, DUE TO THE USE OF PRODUCTS.

AIRETOS's liability under this warranty shall be limited to products that are returned during the warranty period to the address designated by AIRETOS and that are determined by AIRETOS not to conform to such warranty. If AIRETOS elects to repair or replace such products, AIRETOS shall have reasonable time to repair such products or provide replacements. Repaired products shall be warranted for the remainder of the original warranty period. Replaced products shall be warranted for a new full warranty period.

For avoidance of doubt, AIRETOS shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than AIRETOS including improper installation or testing, or for any products that have been altered or modified in any way by an entity other than AIRETOS. Moreover, AIRETOS shall not be liable for any defects that result from your or third party's design, specifications or instructions for such products.



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- PROACTIVE SUPPLY CHAIN
- ON-DEMAND CO-SPONSORING
- GUARANTEED QUALITY OEM

## AIRETOS™ PROFILE

5 Locations – 80% Direct Market Coverage – Affiliate Support



### Quality Functions at all Stages



### Behind the Scenes

<p><b>5%</b> OF REVENUE • INVESTED IN INNOVATION R&amp;D</p>	<p><b>10 YEARS</b> HANDS-ON IN • OEM/ODM WIRELESS MODULE MARKET</p>	<p>DECADES OF • CUMMILATIVE ENGINEERING EXPERIENCE</p>	<p>HUNDREDS OF • ROUTINE INDUSTRIAL CUSTOMERS</p>	<p>THOUSANDS OF • TUNING HOURS YEARLY</p>	<p>MILLIONS OF • INTERNAL AND EXTERNAL INVESTMENTS</p>
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### World Distribution & Samples via OxfordTEC®

<p><b>FREE SHIPPING</b> *on orders above \$100</p>	<p><b>CARD, CHECK OR P.O.</b> NET Terms for trade &amp; government</p>	<p><b>30-DAY RETURNS</b> peace of mind on all items</p>	<p><b>WORLD SHIPPING</b> *also via your courier for account customers</p>
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FOR FURTHER INFORMATION, DEVELOPMENT SAMPLES, CUSTOMIZATION AND VOLUME PRICING CONTACT US VIA [AIRETOS.COM](http://AIRETOS.COM) OR VIA THE VOXMICRO GROUP WHOLESALERS - FOR CONTACTS SEE [WWW.VOXMICRO.TEL](http://WWW.VOXMICRO.TEL)

